JPRS-ESA-85-015

16 April 1985

East Europe Report

SCIENCE AND TECHNOLOGY

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CONTENTS

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CZECHOSLOVAKIA

DESIGN, THEORETICAL INNOVATIONS IN TOKAMAKS SYSTEMS

Prague RUDE PRAVO in Czech 27 Feb 85 p 4

/Article by Michal Strida: "Tokamaks and Nuclear Fusion"/

> /Text/ Tokamak is a sort of an electric furnace or oven. It too requires seasoning--by fire. Only instead of bread or a roast it is used for baking fire. Yes, plasma--the fourth state of matter originating through the ionization of gas, e.g., by high temperature or electric discharge--which forms most of the matter in the universe and has been known to mankind in the form of fire for several million years.

We are standing with Vladimir Kopecky, DrSc, in the tokamak room of the Institute of Plasma Physics of the CSAV /Czechoslovak Academy of Sciences/ with currently progressing redesign of the Tokamak TM1--a system loaned to our scientists in the mid-1970's by the I. V. Kurchatov in Moscow. "The basis for the redesign was setting up a new vacuum toroid chamber of the tokamak," says V. I. Kopecky, "and additional relevant adaptations." It takes a relatively long time to achieve the correct tokamak plasma of a temperature of the order of several million degrees. The chamber must first undergo internal cleaning--bombarding by a flux of particles heated to a high temperature to remove from the vessel's walls everything that could not be removed from the material through chemical treatment, i.e., molecules of oils, hydrocarbons, air, water. It makes itself felt quite thoroughly. Definitely more than an initially lit up oven. Thermal seasoning of plasma then lasts for many months.

From tokamak practice we come to tokamak theory. In it, for their study on linear transformation of high-frequency waves in nonhomogeneous plasma, Vladimir Kopecky, DrSc, together with Eng Josef Preinhaelter, CSc, were awarded in the past year the CSAV prize.

What are tokamaks--highly demanding experimental systems--used for? They are technical means which in the opinion of physicists have brought mankind for the time being closest to prosperity in energy--mastering of the control of thermonuclear reaction.

From the physical viewpoint it involves the attainment of a certain plasma density ranging between 1013 and 1014 ions per cubic centimeter of temperatures of hundreds of millions to a billion degrees Kelvin, where the release of fast neutrons occurs during collisions of nuclei of tritium and deuterium (hydrogen isotopes), or two nuclei of deuterium. This reaction becomes ready for use as energy when the energy of the released fast neutrons exceeds the energy required for maintaining the temperature and density of plasma.

Up to now, however, the attainment of critical temperature by heating the plasma with a flow of electric current induced by a transformer which at the same time generates a magnetic field--to keep the plasma at the requisite distance from the vessel's walls--did not meet with success. Increases in the size of tokamaks also encounter technological difficulties. Conventional magnets which isolate plasma from the chamber's walls are replaced in the largest tokamaks by supraconductive magnets. This is the case, e.g., with the T 15 tokamak built jointly by CEMA countries, which should become a physical prototype of a thermonuclear reactor.

That is why the search is on for additional methods for supplementary heating of plasma that would facilitate the attainment of critical temperature. Technological problems were coupled with problems of the operating mode of future thermonuclear reactors. Up to now, tokamaks have been pulse-type experimental systems. That poses a great disadvantage from the technological viewpoint, particularly with regard to exposure of materials to stress. That is why the search is on for ways that would make future thermonuclear reactors operate as continuously as possible.

The so far most effective experiments have involved the transfer of energy by means of neutral beams of sufficient energy allowing them to penetrate the magnetic field barrier and transfer energy during collisions with plasma particles. Thus, e.g., it became possible to attain with the PLT tokamak a temperature of 80 million degrees Kelvin. The disadvantage posed by these methods, particularly as regards their use in a future thermonuclear reactor, is that the beams must be led into the plasma in a straight line and, consequently, all neutron radiation and plasma particles penetrate back to their own sources of radiation. This poses a serious technological problem of how to protect radiation sources against plasma radiation.

Thus, the most viable appear to be the various high-frequency methods for heating plasma based on supplying energy by means of electromagnetic radiation which epnetrates the surface layers of plasma and is attenuated--transferring energy--at points that require heating. There are three basic methods of high-frequency heating: the so-called ion cyclotron resonance, electron cyclotron resonance, and low hybrid resonance. The currently best worked out methods for heating use

electron cyclotron resonance, primarily due to the existence of very effective sources of electromagnetic radiation--gyrotrons that were developed in the USSR. This radiation, lying in the millimeter wave region, can moreover be fed into the plasma with relative ease by means of light guides without any complicated antenna systems that must be protected against the effects of plasma.

High-frequency heating of plasma has been done up to now by directing the radiation perpendicularly to the basic magnetic field. That, however, poses the disadvantage of allowing electromagnetic waves to penetrate the plasma only up to its specific density. The award-winning study, which found considerable international response, dealt specifically with the problem of how to eliminate this limitation from the theoretical viewpoint. Its authors showed that there exists a certain angle, given by the size of the magnetic field, under which millimeter waves penetrate into the plasma better than under a perpendicular angle. This translates in practice into a potentially more effective method of heating.

This is also to a certain extent due to the fact that the conditions for use of this method are still not at hand. For the time being, no success has been encountered in generating in tokamaks plasma of a density that would prevent high-frequency electromagnetic radiation from penetrating to the requisite depth. That is also why the pending experiment, using the CEMA countries' T 15 tokamak, participated in by Czechoslovak scientists, still envisions using the conventionally directed (i.e., perpendicularly to the magnetic field) electromagnetic radiation for supplementary heating of plasma.

The authors of the award-winning study are not the least disturbed by this fact. The effect, theoretically worked out by them, was experimentally observed in the past in plasma of a much lower density. In the ionosphere, during the passage of electromagnetic waves directed under a certain angle onto the ionospheric layer, there occurs the so-called tripling of signals. They were more concerned with detailing the theoretical problems relevant to this phenomenon that could find use in the future in thermonuclear reactor design.

The award-winning study is an illustrative example of the indispensable need for theoretical knowledge providing a lead in time ahead of practical future requirements. It is one of the small steps by which science, maybe too slowly for some but more purposefully, is coming closer to mastering the control of thermonuclear synthesis. It is gratifying that thanks to Soviet assistance and collaboration the resolution of the potentially most pressing problem of contemporary science can also be participated in by Czechoslovak scientists.

8204
CSO: 2402/9

NEW BIOLOGY CENTER IN SOUTHERN BOHEMIA

Prague RUDE PRAVO in Czech 9 Mar 85 p 3

[Interview with Academician Vladimir Landa, director of the South Bohemian Biological Center of the CSAV, by Zdenek Zuntych; date and place not specified]

> [Excerpts] The South Bohemian Biological Center of the CSAV encompasses four institutes--the Institute of Entomology, the Institute of Parasitology, the Regional Institute of Ecology and the Institute of Experimental Botany. The first three institutes have had their "official" home since January of this year in Ceske Budejovice; the fourth will have to wait for some time during the next 5-year plan. And it is precisely regarding the work of this center, which was the first to move beyond the borders of our capital city, and not only about that work, that we speak with its director, Academician Vladimir Landa.

[Question] Comrade academician, why precisely to the South Bohemia Kraj?

[Answer] The long-term concept of the development of the CSAV through the year 1990 counts on the fact that we will be developing some scientific branches outside of the Prague agglomerate. Naturally, it will not be self-serving but only according to the needs of science, the economic structure of the particular kraj, the goals of the local advanced school structure, etc. And it was precisely these viewpoints which helped decide that the South Bohemian Biological Center should be established. Because it is precisely in agriculture, forestry and care of the environment that the work of our four institutes becomes most characteristic. Among other factors, however, the decision was influenced by the interest of the local kraj party and state organs. Processed material regarding the development of the kraj after 1948 indicated that while all areas of life, beginning with industry and ending with agriculture and, say, through education, developed mightily, the scientific research base was more than weak. After all, in 1974, when decisions were being made about these matters, we were able to find only two doctors of science in the kraj and about 60 candidates of science which, in the number of scientific ranks which we count in this country, represents a completely negligible amount. This is another reason why science came to southern Bohemia. But I

would like to underscore that which I have already said--not in a self-serving manner, not only so that "people would not talk."

[Question] Some 11 years have passed since that time. How has this time frame been for you?

[Answer] If I said it was easy I would be lying. After all, who would have said in the past that our academy would leave the territory of the capital city? This is clearly connected with some entrenched "traditionalist" matters. Some people simply were not able to imagine that a scientific workplace could function in the kraj. There was talk of a "communal" academy--there was doubt regarding the possible results. But I can already confirm today that the decision which arose in conjunction with the conclusions of the May session of the CPCZ Central Committee in 1974 was correct and justified. Although we had to deal with certain provisional conditions in Ceske Budejovice, which we were provided with in the facilities of the former agricultural middle school, even this period is now nearing conclusion because in the spring we will conclude the first phase of the creation of our new area. The energy center is already in operation, as is the transformer station and the service building; in February, we contracted for the building of the Institute of Entomology and this month we will take over the building of the Institute of Parasitology. Thus, the conditions for our work will improve significantly and there is no need to doubt that this will be reflected in the results themselves. Today, we have successfully solved even the personnel problem regarding the institutes. This was also one of those debated problems--whether scientific workers would go to the kraj at all. And you see, they went. And I believe that they went gladly. These are primarily young people which might lead someone to entertain certain doubts about the results of our work. But they are only doubts. Let us consider that the academy is aging. Many of those who work there from the very beginning are nearing retirement age and one of our significant tasks is precisely the training of new scientific workers.

[Question] One of the reasons why your workplace moved to southern Bohemia was also the requirement that science be in closer proximity to its base. Have you successfully fulfilled this task for the time being?

[Answer] Honestly said, we had certain fears regarding this in the beginning but as has been shown, practice has outdone all expectations because the collaboration of all our institutes with individual enterprises is not only good but, what is more important, it is successful. If I have to be specific, I would like to mention the collaboration with the South Bohemian State Forests with respect to the protection of forest growth, in the battle against the pine bark beetle and the horntail.

[Question] In April, it will be a year since the establishment of the South Bohemian Scientific Pedagogical Association, composed of your center, the Ceske Budejovice faculty of the Advanced School of Agriculture and of the Pedagogical Faculty. How do you evaluate this period?

[Answer] In the past, and let us say honestly that it was detrimental to matters, workplaces of the CSAV and of both ministries of education were significantly separated. And it was precisely this that we had brought to our attention by the 16th Congress of the party and the 8th Session of the CPCZ Central Committee, which charged us with connecting the capacities and making it possible for scientific workers from advanced schools to participate in the joint work and, by the same token, to make it possible for specialists of the academy to provide space for the education of new workers at advanced schools. This is why this agreement, the highest degree of which is precisely the scientific pedagogic association, came into being. In the beginning we did not exactly know how such a collaboration should look because, after all, this was the first such association in our country and, besides, we have enough of our own tasks to do; but we took this task on as our own and are attempting to fulfill it. However, it will take some time yet before everything becomes a matter of course and, as the saying goes, before it is on track. Meanwhile, the council of the association has been constituted and directs the collaboration in three regions--in the scientific area, in the pedagogic area and in connecting and utilizing installations and costly instruments.

The first results have already come in. This year, for example, the 2-year postgraduate course in integrated plant protection is concluding. Other courses will begin and will be devoted to animal parasites, soil biology and crop varieties. Our communal goal is to increase the "biologization" of all agricultural studies, because in our opinion graduates should be better able to apply modern biotechnology in their practice. This is why, at the local faculty of the Advanced School of Agriculture, it is expected that starting next year there will be created three specializations which have to do with plant protection, soil problems, and the basics of variety improvements. This would be a 5-year study in which students, after completing the second year or the third year, would become specialized. Through joint work under the direction of instructors from the Advanced School of Agriculture, teaching plans were created and we are now discussing the best ways to implement individual seminars and lectures. One thing, however, is clear. We want to increase the biological content of the study program but, at the same time, we do not want to confuse the Advanced School of Agriculture with the Faculty of Natural Sciences.

5911
CSO: 2402/10

GERMAN DEMOCRATIC REPUBLIC

'COMPROMISE' URGED IN MONITORING DANGERS OF DIOXIN

East Berlin SPECTRUM in German Vol 15 No 11, 1984, pp 14-15

[Article by Dr Hans Swart, Research Center for Chemical Toxicology]

[Text] Workers of the Research Center for Chemical Toxicology have compiled an informative data bank for hazardous materials, which is accessible to the scientific and industrial communities. All states are called upon to combat more vigorously the effects of toxic materials. For the effects of these toxic materials are not restricted by national boundaries. Several dozen of them have already been the cause of pollution on a global scale.

Leipzig 2392 357--the phone rings: an inquiry by the safety inspector of a paint factory about steam pressure and hazardous properties of dimethylformamide. After a short data file search, the answer: at 20°C steam pressure 0.36 kPa, saturation concentration 11 grams/m^3, only slightly toxic, LD_{50} rat oral 7 grams/kg, mild irritant, ZNS-toxin with critical concentration starting at 60 mg/m^3, liver toxin, skin reabsorption; acute: irritation of eyes and mucuous membranes, headache, nausea, vomiting, weakness, disturbances in coordination, anomalies in liver and kidney functions; chronic: itching of the skin, edema, indigestion, liver damage; teratogenic for mice; MAK_k-value 10 mg/m^3.

The manifold questions concerning health issues and environmental protection when dealing with chemicals are not always as easy to answer as was the case here. From all segments of the economy they arrive almost every day by phone, mail, or in person here at the Work Group for the Documentation of Hazardous Substances of the Research Center for Chemical Toxicology [RCCT] in Leipzig. This Group collects and catalogues information on hazardous substances according to their toxicological aspects and thus represents, together with the Central Information Service on Toxicology in Berlin, the Toxicological Data Bank in Graupa and other establishments, an important part in the toxicology information system of the GDR.

As in all nations with a strong chemical industry, the problems caused by toxic substances are not diminishing here in our own country. New methods of production, conversions dependent on resources as well as rationalization

measures frequently pose new toxicological problems as well. In addition, there is the progress in scientific knowledge, which, in regard to the long-term toxic effects of a substance, i.e., its mutagenic, carcinogenic or reproduction-toxic properties, all of a sudden exposes the dangers in substances previously thought to be harmless, with consequences as far-reaching as the almost total substitution of a substance--as seen, for example, in the case of asbestos. In future production planning and procedural development it must become established practice that environmental and industrial toxicologists be consulted right from the beginning. With this goal in mind, the Group for the Documentation of Hazardous Substances is trying as well to make some headway, e.g., in the area of "Carbochemistry" [conversion of coal into carbon-based chemicals].

File on Toxic Substances

The most important basis of our information service is the "File on Toxic Chemical Substances," a manually-kept compilation of facts containing abstracts extracted from the international technical literature, but also, as far as possible, with calculated values and insights gained by drawing reliable analogous conclusions from the behavior of similar substances. The 70 or so substance parameters are categorized as follows: identity of the substance; application; identifying physical data; safety data; chemical reactivity; chemical analysis; detoxification; elimination; storage; toxicology; hygiene and safety precautions in the workplace; environmental protection; and bibliographical references.

According to their special character, methods of reporting and classification as well as the safe elimination of waste products or damaged goods are the main concern. Particular emphasis is placed on conforming to internationally recognized and standardized classification methods for toxic substances and/or substances resulting from their reaction in water, air, and biological matter. Suggestions for an effective and practical method of detoxication or elimination of a substance can be deduced from its chemical reactivity as well as from its own toxicity, reaction substances, the anticipated environmental impact, and from other factors. However, this has to happen from the point of view of a total ecological system. It should always be established whether a waste product may be capable of regenerating or whether it can serve another purpose. It is certain that many chemicals can be transformed into less toxic products by means of chemical reaction. For this purpose detoxication agents are required, the manufacture of which in turn entails the generation of waste products, which usually enter the biosphere through waste water and waste air. In many cases detoxication is therefore only a trade-off for geographical relocation of the environmental pollution. Normally, chemical detoxification should be used for highly toxic and environmentally hazardous substances, especially in cases of accidents. As far as possible, methods of burning--which in itself is not always without problems--and regulated storage should be implemented.

The file on toxic substances at present contains data pertaining to 460 substances. Originally conceived as a unit for in-house use, it was made available in microfiche form to interested parties as early as 1978. Today microfiches with information pertaining to single substances or the complete set

can be ordered for a small fee. The criteria originally chosen for the selection of substances have, by and large, stood the test of time. In order to be able to respond to many requests very quickly, only solvents were worked with during the first year, because these substances are used in almost all segments of the economy. In order to improve the efficiency of procedures, selection was grouped during the following years in three categories: some highly toxic substances, even if they are not widely used; industrial chemicals, even those which have a low degree of toxicity, but are widely used; and homologous groups, e.g., alcohols.

The selection process is carried out in cooperation with practice-oriented partners from the economy; suggestions are always welcome. To date, inquiries directed to the RCCT have been 98% substance-oriented in nature; the one-dimensional data bank design has proved to be the right choice. With the erect-card file, a response time of one minute can be achieved. We are planning to increase the file by 50 substances per year.

A second important data source is the "Registry of Toxic Effects of Chemical Substances," published by NIOSH in Cincinnati. The 1980 edition contains toxicity data for about 45,000 chemicals, including data relating to carcinogenic, mutagenic and teratogenic effects.

Evaluation of Toxic Substances

Among the tasks of the Group is assistance in assessing in concrete situations the effects of hazardous substances upon human beings and the environment. For example, the infamous "dioxin," as in the well-documented (in the mass media) instance of Seveso [Italy] of the toxin 2, 3, 7, 8 tetracloride benzo-P dioxin, together with other polyhalogenic dibenzo-dioxins, biphenylenes and structurally similar substances in all industrialized countries has developed into an ubiquitous toxic substance, which, because of its unusually high degree of toxicity and its long-term effects and persistence, has time and again given rise to headlines, especially in the Western media. Polyhalogenic compounds of this kind usually result from thermal and pyrolystic processes, in which either chlorine phenol alone or certain other chlorine compounds in the presence of oxygen have a part. Recently, traces of TCDD have been found even in samples of mother's milk as well as in the exhaust gases of incinerators. There is, however, not always a chronic or an acute danger for humans in all cases where, with the help of highly sensitive analytic instrumentation, TCDD is found in the environment. But the task is to relate in a responsible manner the concentrations found to the presently accepted tolerance levels, e.g., the "minimum risk level" of 1 pg/kg/d and to suggest that corresponding steps be taken if required.

Not a policy of "all or nothing," but only compromise, the long-range, goal-oriented reduction of the burden of toxic substances in keeping with both scientific knowledge and economic possibilities can lead to solutions acceptable to all sides. Another task of a responsible information source on toxic substances is to provide impulses in this direction.

Who needs the data?

The prime requestors are the workers at the Research Center for Chemical Toxicology themselves, who, for example, refer to the toxin substance file during the chemical analysis of the effect of environmental accidents, i.e., the dying of fish; or in the framework of their pre-legislative activities in special commissions concerned with determining maximum levels of concentration in the workplace, or maximum emission levels, for example, for the inclusions of toxic substances in the Law on Poisons.

Among the users of this data file are combines and factories, e.g., the Leuna Works "Walter Ulbricht," the Petrochemical Combine Schwedt and the Stendal nuclear power plant, and also government offices, especially the work hygiene inspection offices, the departments for environmental protection and water resources, as well as hygiene inspection offices in the districts; but also institutes of the Academy of Sciences, university institutes, among the latter mainly the chairs for hygiene in the workplace.

The following examples are intended to illustrate the broad spectrum of the services rendered. For the semi-conductor industry, documentation was prepared on doping gases (such as diboran, stibin and hydrogen selenide), which had been at times regarded as exotic, highly toxic substnaces. Factories and hygiene inspection offices request our informative cooperation in the investigation of the causes for the inconvenience or poisoning of workers and residents living in close proximity to places of production. An especially high percent of information given deals with preventive health care and preventive measures in the workplace in dealing with certain chemicals. Among our customers are not only the chemical industry, but also the machinist industry, geological surveying, the construction industry, light industry, and other industrial branches, even including a large bakery, a brewery and a distillery. Even handicraft shops and private citizens request toxicological advice.

Finally, the cooperation of the work group responsible for the loose-leaf collection "Instructions for Handling Dangerous Substances," published by the WTZ for the protection of workers in the chemical industry should be mentioned, which has become for many users in the GDR a low-cost, practical reference source. Activities in this area also have an important economic aspect, because foreign currency, otherwise required for the importation of information sources, does not have to be expended. The information on toxic substances in the GDR is in conformance with the international efforts of the United Nations as expressed, for example, in the "International Register of Potentially Toxic Substances" in Geneva.

12792
CSO: 2302/63

HUNGARY

PLANS, DEVELOPMENTS IN ROBOTICS

Budapest MAGYAR HIRLAP in Hungarian 28 Feb, 2 Mar 85

[Article by Kristof G. Kocsis: "Robot Reveille"]

[28 Feb 85 p 7]

[Excerpt] Domestic robot manufacture and use has to overcome a disadvantage of about 15 years, and not only in comparison with the developed Western European countries. Robots considered of good quality on the socialist market are being manufactured, primarily on the basis of a Japanese license, in an institute in Bulgaria employing several hundred people. Successes have been achieved with domestic developments in Czechoslovakia. According to a 1979 government resolution in the GDR 45,000 robots will be manufactured and placed into various systems by the end of this year. They hope to increase the number of robots to about 120,000 in the Soviet Union by the end of the decade.

Domestic manufacture thus far has been characterized in large part by hesitant, isolated developments, sometimes by dead ends, by individual initiatives which start out promising but falter. The first swallow in the mid-1970's was the moderately capable "Robi." Two of these were made but then the experiment was aborted for lack of interest. An enthusiastic team of designers at the Eger Precision Assemblies Factory developed the "FER" manipulators but later--lacking a customer--they were abandoned to the Gyongyos factory of United Incandescent. Here, making use of the experiences, they developed it into an automatic picture tube loading device, and they have exported about 500 of these. This change of patron--as will be seen--was probably a crucial event in domestic robot history. When the people in Gyongyos were joined to the Microelectronics Enterprise in 1983 the momentum was broken. This firm, interested primarily in electronics, is only now beginning to discover a new profile for automatic devices to test and check integrated circuits.

A Palette With Too Many Colors

A system made with equipment manufactured on the basis of a license from the Japanese firm Daido is on the threshold of realization at the Custom Machine Factory of the Gsepel Works and the developmental institute of the Machine

Tool Industry Works has sold thus far two machine tools equipped with robots of Bulgarian manufacture. The recently formed Assembly Techniques and Automation Factory of the Bakony Works is trying to start manufacture of manipulators being made on the basis of a Bosch license. The Gyor Recard Lima is working with a welding robot and has signed a cooperation contract with an Austrian firm. Tungsram has signed up a Soviet order, the foreign discussions of Videoton are promising, and perhaps we need not say that different types of robots are involved every time. And we have not even mentioned those who are developing on their own in silence. The palette has too many colors, especially if we add that the number of real robots already in operation can be put at 20 at the most. All this, unfortunately, does not suggest a competitive spirit; it suggests much more a lack of coordination.

According to many the business success of United Incandescent, already mentioned, is in the background of the lack of well conceived robot development. The several hundred domestic picture tube loading robots have gone almost exclusively to the Soviet market--there being no domestic picture tube manufacture--and this quantity counts as a very large series in robots. So in a peculiar way domestic robot manufacture, far behind the European front line in regard to quality, can brag of one of the largest series on our continent. The ensured market does not inspire further development to expand variety and all this--in the opinion of the experts--has preserved the backwardness.

It Is Not Economical in the Beginning

In contrast to a number of countries in the world, an independent central program for robots has not been prepared in Hungary. According to the experts this has its advantages too; in this way we have avoided the stumbling blocks of campaigns. But this is also why there are too many colors and why less money than needed has gone to this goal. Those responsible here have imagined the production of robots as part of the development of machine manufacture. Only one chapter of the National Medium-Range Research and Development Plan developed in the plan period deals with outlining the possibilities for robot applications. A competition of the OMFB [National Technical Development Committee] and the Ministry of Industry was born in connection with this too; it will finance from central sources half of the use of robots coming from socialist countries--if the investment is completed this year. The competition brought in 80 robot use ideas from 43 enterprises and 33 of these finally met the requirements. Those interested received 91 million forints in support for these.

This sum is not too high. The use of robots is never economical at first. It only becomes so if it fits entirely into a well organized manufacturing process.

On the basis of what has gone before domestic industry does not appear to be prepared to receive robots. The large series production which attracts robotization like a magnet is missing. For the time being the relatively cheap live work and the moderate costs sensitivity of the enterprises hardly

justify reaching for robots with both hands. The forced brake on investments poses an obstacle to a reorganization of the entire manufacturing process. In addition, the varying quality of raw materials and semifinished products would require robots which were excessively "intelligent" and thus expensive. (For example, a simple robot would try to force a screw into a hole even if they had forgotten to thread it.) The obstacles posed by the western embargo policy tower before the manufacture of robots, and the relatively undeveloped nature of the domestic background industry is also difficult to bridge over.

They Should Be Manufactured

So the domestic application areas for robots must be selected with special care. The Machine Industry Technological Institute is responsible for mapping the possibilities. At present about a dozen robots are in operation at various enterprises. Those working there are leary of expensive, unuseable investments having the character of a status symbol. In their opinion what can be done cheaply is just to acquire an ever larger number of robots suitable for just this task, but at least as important are the automatic equipment and peripherals serving them. According to the surveys--and an OMFB study is being prepared on this--the most economical domestic applications bringing the quickest success might be stamping machine services, arc welding and painting. Simple loading manipulators might be used in innumerable places. Soon the products of the domestic machine tool industry will be marketable in West Europe only with robot service. The technical background for these tasks is available, as will appear from the second part of our series, talking about manufacturers.

Robots simply must be manufactured, more and more of them and as soon as possible. According to the formulation of one expert the cause of robot development cannot be separated from the structure of industry as a whole. Automation not only requires a modern background industry, it can have a feedback effect on the organizational level of all production as well.

[2 Mar 85 p 7]

[Text] Two Manufacturers, Two Opinions--It Could Be Good Business

In our issue yesterday we described domestic robot developments as rather uncoordinated. But we also said that the technical background for further progress has developed already. Domestic industry needs many cheap, simple robots; but the lack of precision in semifinished products would require intelligent, and thus expensive, robots. It is primarily large series manufacture that draws robots. But there is little such in the structure of our industry. In the absence of an adequately developed background industry it would be useful to begin robot manufacture on the basis of licenses.

We questioned one expert each from two manufacturing firms from among the developers. One of the firms can brag of a history of 15 years in the manufacture of manipulators. They began there with their own development and "aimed at" a cheap device which could be sold in large numbers. The first robot has just now been made in the other firm, their science is based on

license purchase, they are not trying for large series, rather they are trying to find customers on the western market as well with special devices.

The assembly technique and automation factory of the Bakony Works was formed at the beginning of this year but they have been dealing with the manufacture of assembly lines and the simple robots built into these at the parent factory since the start of the Zhiguli program. It is hardly by chance that the development of the automatics and robot profile in this factory is linked to the vehicle industry which produces in large series. Of course, since there is no domestic manufacture of passenger cars, this is only via export. Tibor Kovacs, chief engineer of the newly formed factory, spoke as follows about the immediate reasons for adopting the business of automatics:

Breakthrough

"When the factory began export of automobile electrical parts in the framework of the Zhiguli program the assembly technique, organizational and automation level of the Bakony Works lagged far behind that of Ladak, which provided the license. The designers of the Fiat factory, understandably, fit the design of the parts to the technical level of their factory. So if we wanted to produce a similar quality we had no choice but to build our own automated assembly lines. The first of these got started in 1967-1968; then in 1970 we purchased a Bosch license, with which we acquired modern organizaticnal and assembly technique methods also."

"The automatic devices built into the assembly lines belong more to the manipulator category rather than to the robot category. It is probably that by now the Fiat designers are designing differently also."

"That is true, but in our opinion the structure of domestic industry still requires primarily this sort of simple equipment. What is more, the demand even for these is increasing only step by step. It required 6-7 years for us to work our annual production up to 50-60 million forints. But this year is the year of the breakthrough; with our contribution to the renovation of the Moskvich factory we would like to double this. In any case I am convinced that the reconstruction of the Soviet auto industry will be a virtually inexhaustible market for robot manufacturers."

"So, finally, what proportion of your products is exported?"

"Thus far 40-50 percent of our production is sold abroad. According to our hopes this may now increase to 80 percent. In addition to the Soviet market we recently made an offer in Yugoslavia."

A Moderate Attraction

"What sort of business is robot manufacture?"

"The price of each assembly line goes from one to several tens of millions of forints depending on its complexity. As for profit, if an enterprise buys an assembly line it is also buying an increase in productivity, the

possibility of producing a larger number of units on it. So we have products on which we have a really big profit. This is realistic too, because there is an extraordinary amount of intellectual work, the result of custom development, in automatic equipment."

"In the meantime, obviously, the seller of the license, Bosch, has already modernized its manufacturing lines. How do you intend to modernize your products?"

"Bosch really has changed the manufacturing tools built into the assembly lines; its system has become faster and more flexible, the modular principle is being realized better, and it can work with a smaller inventory. We have already prepared, technically, to take over a new Bosch license; the rest will depend on the outcome of business negotiations. Our own plans include primarily the development of peripherals serving the robots. These are at least as important as the robots themselves, but so far they have been forced undeservedly into the background here...."

The other manufacturer selected was the Custom Machine Factory of the Csepel Works. A year ago it bought a modern robot license from the Japanese firm Daido and it purchased two finished devices as a first step. Using these they built the first model system for the Iron Works and will soon deliver an entire forging line. But they see differently here the reasons forcing use of robots than they do at the Bakony Works. Gyula Fulop, chief of the technical development department, spoke of this as follows:

"The equipment involved could not be operated at the Iron Works even for one shift; there were not enough men for the hard forging work. It is primarily this sort of motive that might prompt domestic enterprises to use robots. For us the ratio of fixed costs in the prices of products, which cannot be decreased, is very high, the increase in productivity which can be attained with robots is only a more moderate attraction."

"Taking this into consideration, what sort of customers are you counting on?"

"For the time being our offering includes two basic types of robots in six different load versions. In addition to the model system mentioned, we would like to produce five units this year. We record 10 concrete needs and of these, for example, a robot which can be used with a lathe of the SZIM [Machine Tool Industry Works] is on the verge of being ordered. We first introduced this 5.5 million forint device at the Hannover Machine Industry Fair. In the future we will be producing an average of 10 robots per year."

Export Too

"For the external market also?"

"Our capitalist business prospects are very good too, because few are offering hot plant robots, especially in this capacity range."

"It could be a stumbling block for manufacture based on a license if the ratio of the import parts in the equipment that are difficult to obtain is too high."

"Our first 10 robots still contain a significant capitalist import and a 2-percent ruble accounting import. But beginning with the twentieth machine we intend to cut the capitalist import to one third."

"Finally, what are your developmental ideas?"

"Our largest load bearing model can move a mass of 1,000 kilograms--with a precision of 2 millimeters. We would like to create a 2,000 kilogram version. Another plan is a casting cleaning robot. Thus far nowhere in the world have they succeeded in automating this extraordinarily hard work which is very harmful to health."

Robots at the Iron Works

According to the plans the first forging line using Daido robots will be delivered to the Iron Works of the Csepel Works at the end of March. This will be used to produce vehicle parts. The annual capacity of this forging equipment was 2,300 tons earlier; now it will increase by 700 tons thanks to the robot. So they calculate at the enterprise that at this work site the sales receipts, which had been about 90 million forints, will increase by more than 27 million forints. So they calculate that the investment will pay for itself in 4-4.5 years. The OMFB and the Ministry of Industry provided central support amounting to two thirds of the investment sum to set up the model system

8984
CSO: 2502/31

HUNGARY

PHYSICS RESEARCH INSTITUTE TPA-1148 POPULAR

Budapest SZAMITASTECHNIKA in Hungarian Jan 85 p 4

[Article by Peter Forro, of the Central Physics Research Institute: "The KFKI Megamini"]

[Text] Hungary already has traditions in the area of development and manufacture of minicomputers. This means that the domestic computer technology culture, in any case quite varied, may be rooted best in this computer category. It was in this category that we were best able to satisfy the domestic needs of 1970's; users could get access to these machines more easily than to the other categories.

The development and use of minicomputers goes back many years in the Measurement and Computer Technology Research Institute of the KFKI [Central Physics Research Institute] also. One of the most successful models in the second half of the 1970's was the TPA-1140. We recognized relatively quickly that despite its advantageous properties the operating memory of this machine was small, that further development was absolutely necessary, especially for applications requiring a multi-user environment.

The TPA-1148 megamini computer with a maximum of 4 M bytes of operating memory was born in 1982. That our recognition was correct is proven by the great user interest shown toward the machine since then. Without trying to be complete let us list a few firms which received or had received machines of this type in 1984--the PSZTI [Computer Technology for Financial Affairs], the PSZSZI [Postal Computer Technology and Organizational Institute], power service enterprises, the KSH [Central Statistics Office], universities (the Budapest Technical University and the NME [Heavy Industry Technical University]), the MEM [Ministry of Agriculture and Food] Airplane Service, the Workers' Guard, Ganz-Mavag, the Water Affairs Planning Enterprise, the Commercial Organizational Institute, etc.

A good number of them requested not only one machine but several. It can be seen from the listing that these are domestic users, but we have also shipped a few to the Soviet Union.

The TPA-1148 computer is being used in the most varied areas of the economy, although for the most part in the area of business machanization. This is

interesting because the KFKI-MSZKI [Measurement and Computer Technology Research Institute of the KFKI] does not work in business mechanization with greater strength than in the other two chief applications areas, in industrial and laboratory applications. The difference probably arises from the fact that in this area it succeeded in finding partners for projects of national significance who were able to participate with great strength in preparing applications programs and with the several model systems they were able to arouse the interest of other users in the computer technology equipment of the KFKI.

It was possible to satisfy the increased demand only with a well functioning manufacturing base. In this area our most important partner is the Computer Technology Experimental Operating Deposit Association (SZKUBT) in Szekesfehervar. Surely it is well known that this firm is the joint developmental enterprise of the Videoton Electronics Enterprise, the SZKI [Computer Technology Coordination Institute] and the KFKI. Its chief task is the efficient manufacture of the research and developmental results.

They began to manufacture the TPA-1148 megamini computers here in 1982 after completion of development. The first example was finished in January 1983 and in September 1984 workers from the SZKUBT and the KFKI held a little in-house celebration on the occasion of the completion of the 100th system using this machine type.

Only 20 months have elapsed since manufacture of the first system and to have manufactured in this short a time 100 systems belonging to such a computer category is, we think, unique in the history of domestic computer technology.

In addition to the developers, praise for this goes primarily to the workers of the association who quickly solved the usual problems of beginning manufacture and did everything they could to produce reliable systems. There were a few hang-ups, as always, but according to feedback from the users the reliability of the machines is adquate, as is indicated primarily by the many thousands of hours of operation which can be read from the machine journals of the users.

Almost simultaneously with the manufacture of the 100th TPA-1148 they finished at Szekesfehervar the first TPA-11/440 computer, which is a newer developmental achievement of the KFKI in the megamini computer category. The 32 bit internal systems bus (the X bus) has a throughput capability more than four times that of the UBUS.

The modern diagnostics and the cache memory are both characteristics which make the TPA-11/440 suitable for satisfying user needs even in the second half of the 1980's.

We hope that we will soon be able to report on the celebration marking the manufacture of the 100th unit of this latest machine, but by then a lot will have been written in these columns about the computer technology achievements of the KFKI-MSZKI and the SZKUBT.

8984
CSO: 2502/25

HUNGARY

TECHNICAL COLLEGE TO OFFER INFORMATION COURSES

Budapest SZAMITASTECHNIKA in Hungarian Jan 85 p 12

[Interview with Dr Sandor Domonkos, director-in-chief of the Kalman Kando Electric Industry Technical College, by Dr Ivan Szabo: "Information Training at the Kalman Kando Electric Industry Technical College"]

[Excerpt] In the fall of this year the Kalman Kando Electric Industry Technical College (KKVMF) plans to start further training in informatics in the evening and correspondence branches. On this occasion we looked up Dr Sandor Domonkos, candidate and director-in-chief of the KKVMF, who, together with Dr Andras Szucs, computer technology systems organizer and economic director, and Dr Dezso Sima, candidate and director of the Mathematics and Computer Technology Institute, answered our questions.

[Question] An informatics section is a very serious undertaking. In connection with this, could you describe the college?

[Answer] The legal predecessor of the college was founded in 1898. It took the name of Kalman Kando in 1941. The Council of Ministers founded the college in 1969, taking over the name of the world famous pioneer in electric traction. At present the college trains about 1,400 day students and 750 evening or correspondence students in nine specialities. The specialities taught are the following: microelectronics, parts and device technologies; signal industry; instrument industry and automation; computer technology devices; organization and application of coputer technology; heavy current automatics; electric energetics; electric machines and devices; and technical teacher training.

[Question] Why is there a need for further training for factor engineers at your college?

[Answer] As a result of technical development the acquired information quickly becomes obsolete and there is a need to acquire new information. In 5-6 years so much new information accumulates that mastering it is absolutely necessary for efficient performance of work by the technical intelligentsia. Our college starts from this when it offers further training in accordance with its profile or starts training in a new specialty.

Energy and information will come into the foreground by the turn of the century. A vigorous development of these areas will become of vital importance for the Hungarian economy. Modern and efficient industrial and agricultural production, the banking system, state administration and services will increasingly require the use of modern microelectronic and computer technology devices, the ordered storage of the necessary information, access to it and the processing of it.

So informatics, the technology of the collection, passing on, processing and efficient use of information and data, has become of vital importance from the viewpoint of preserving our international competitiveness.

The planned informatics section is a novelty in domestic technical education. We are starting this section under the patronage of the Mathematics and Computer Technology Institute and the Signal Industry Institute, but the Heavy Current Automatics and Equipment Institute is "helping out" with the teaching too.

We established a committee to develop the thematics for the training. Its members are: Dr Attila Pocza, deputy director-in-chief (electronics); Dr Istvan Kerpan (signal technology); Dr Dezso Sima, candidate (computer technology); and Dr Andras Szucs, economist (systems organization).

The Kalman Kando Electric Industry Technical College has great traditions in teaching computer technology, signal technology and electronics. Based on these the college is preparing to introduce instruction in this technical and scientific area, which is taking on key importance, on the one hand within the framework of basic subjects for every student of the college and on the other hand in the form of further training for factory engineers. In the course of general training we will acquaint all our students with the basics of informatics. Graduate factory engineers or technical and economic experts with higher eduation degrees who already have the basic computer technology expertise can apply for the informatics section being started in the correspondence and evening branches within the framework of factory engineer further training.

In the interest of satisfying the needs of the economy we are also considering starting training in informatics as an independent section in the day branch. We would like to provide the economy with factory engineers who would have proper preparation in setting up and operating modern informatics systems.

Informatics is a new interdisciplinary area the nucleus of which is provided by computer technology hardware and software devices and systems, adequately supplemented by the necessary communications technology, robotics and applications information.

Training takes four semesters, requiring 100 hours per semester. In the fourt fourth semester the students prepare a thesis and get a degree following successful defense of it.

We are planning to teach informatics with three points of emphasis. Within industrial informatics the students will become acquainted with embedded

microprocessor systems, with the programming of industrial robots and with the practice of computer aided design, manufacture and quality control.

The significance of this training direction is underlined by the fact that in the future only equipment and devices, measuring instruments, signal technology devices and industrial drives fully exploiting the possibilities of built-in microelectronic devices can remain competitive on the world market.

Instruction dealing with enterprise informatics will acquaint the students with the practice of developing and using information systems, with database management systems and with leadership and organizational questions.

It must be noted here that one can no longer even imagine efficient enterprise operations, manufacture and the processes which precede, follow and service it (keeping records on orders, production programming, accounting, material management, etc.) without computer support, just as modern engineering work, instruction or medical diagnostics cannot do without the use of computer technology devices and the necessary information.

Students desiring to learn about software technology will master the practice of designing, executing, documenting and tracking software products, the unique requirements of program products operating in a real-time environment and the theory and practice of simulation techniques and database management.

[Question] Can we expect that those participating in the training will get, in addition to the modern information available, information which will call attention to the sort of stumbling blocks there may be to the realization of their aspirations on return to real life?

[Answer] We also consider this very important. We want to develop a critical professional attitude which will reflect back on industry or on the economic sphere in which they will be active. By virtue of mastering the new information it is expected that the engineers, economists and computer technicians will come closer to one another and that there will be greater understanding and cooperation in those areas where the so-called job overlap is greatest.

[Question] Today, when we are struggling with the problems of data recording, systems theory, integration, organization, leadership, tools (hardware and software) and fitting them together, how can the information acquired become effective?

[Answer] In addition to instruction on the principles of and tools for information we intend to acquaint the students with the realistic possibilities for and limits on the use of informatics. Naturally domestic reality puts a limit on the utility of the training--for example, the domestic price and accessibility of modern computer technology hardware and software tools or the organizational level of our enterprises.

[Question] As a result of the training can we imagine the development of a professional view which regards the separate computer technology processes as parts of a truly complex, comprehensive informatics process from the

origination of the data to the use of the data? Can you imagine training in our homeland in the near future which does ot seize a task in the middle of the process, taking out of it, for example, only administration and its immediate environment (most often with imprecise information about it), but rather, where possible, builds on the information process as a whole?

[Answer] Certainly this is the optimal solution, for in this way the advantages of using computer technology are multiplied. For example, the results of computerized parts design could be used directly in the computerized manufacturing process, or in the case of orders handled by a computer the computerized programming of manufacture could be carried out much more quickly and reliably by taking over the data directly. I feel that in some cases--if not everywhere--the conditions for the development of such computerized systems are given. It is precisely the task of our informatics training to direct attention to this way of looking at things. Mastering this attitude and the necessary knowledge, coupled with good human and organizational engineering properties, constitutes the intellectual precondition for high level computerization and thus for the development of the economy and of society.

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CSO: 2502/25

COMPUTER NEWS FROM SOCIALIST COUNTRIES

Budapest SZAMITASTECHNIKA in Hungarian Jan 85 p 5

[Article by A. K.: "News From the Socialist Countries"]

[Text] German Democratic Republic

More than 43,000 microcomputers are already in use in the GDR.

The largest computer manufacturing enterprise, Robotron, exports about 70 percent of its products. The socialist countries have a 90 percent share of the computer technology devices sold abroad. Each year they deliver about 80 larger systems (for example, the ES 1055M) to the Soviet Union. New items for 1984 include: the Robotron Z9001 home computer with storage of 22-38 K bytes RAM and 4-20 K bytes ROM; a new electronic bookkeeping-accounting machine with a storage capacity of 16 or 32 K bytes and a 16 x 64 character display. A matrix or daisy wheel printer can be connected to it. The PHM 41 is a further developed industrial robot with five degrees of freedom capable of moving 0.5 kilograms. The Kombinat Mikroelektronik has also developed a home computer, the HC900, based on a microprocessor of GDR manufacture, with as storage capacity of 20 K bytes and a display containing 320 x 256 pixels.

Bulgaria

A 1984 product is the ES 8566 group display station which is capable of serving a maximum of eight video or printer terminals.

The new SM-1605.M1 portable terminal, weighing only 9.6 kilograms, contains 128 bytes of buffer storage. The SM-5412 model 80 M byte disk drive unit has appeared. Another new product is the Evmolpya electronic typewriter which contains 3,000 characters of storage.

Poland

The ES 8371.01 telecommunications processor with 16-128 K bytes of storage is capable of data transmission at a maximum speed of 19,200 baud.

The IRB6 and IRB60 industrial robots with five degrees of freedom are suitable for moving loads of 6 and 60 kilograms respectively.

Romania

The new microcomputers have appeared--the Independent 102 and the Felix M118. The form can have a maximum store of 4 x 32 K words and the storage capacity of the latter is 64 K bytes.

They have introduced a modular intelligent terminal with the designation Telerom P1 based on the 8080A microprocessor with stores of 56 K RAM and 8 K EPROM, with 16 interrupt query lines and various peripherals.

The TPCD.1 portable terminal serves data collection purposes. It is suitable for putting data directly into a computer or with the aid of modems and telecommunications lines.

A new peripheral is the MD 10 plotter, which has a resolution of 0.2 mm and prepares drawings on A/3 format paper. It has an axis direction speed of 20 cm/s.

Czechoslovakia

The SM-52/11 minicomputer in the MSR series has a central storage of 128 K words and a cache memory of 1 K words. The cycle time of the machine is 600 ns.

The new Digigraf 1208A plotter has a maximum speed of 70 cm/s and a resolution of 0.01 mm. Its precision is plus or minus 0.05 mm at a speed of 50 cm/s. The size of the plotting area is 1,189 x 841 mm. Seven standard graphics programs are available to users.

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CSO: 2502/25

HUNGARY

FURTHER CUTBACKS ON ACADEMY PUBLICATIONS NEEDED

Budapest MAGYAR HIRLAP in Hungarian 7 Mar 85 p 8

[Article by Erika Zador: "What Ails You, Acta?"]

[Text] "The March 1983 issue of SZAZADOK has appeared," said a colleague of mine as he came toward me in the editorial office waving a copy of the journal. "Well, is there something interesting in it?" I asked curiously. "You don't understand that this is the March 1983 issue and it is already the end of 1984. This must be a world's record for delay," he said excitedly. "If that's all it is about," I enlightened him politely, "you are mistaken. There have been longer delays of 30 to 40 months."

My being so well informed I owed to a survey conducted 2 years ago by the ad hoc committee of the Hungarian Academy of Sciences on this subject. Academician Bruno F. Straub, chairman of the committee, reviewed the situation also in an interview with our periodical.

No Improvement

The committee stated that there was no need for the announcements of the Academy departments. News of common interest relating to the departments would "fit into" the MAGYAR TUDOMANY journal, and on the other hand it would be advisable to publish notices of inaugurals and commemorations, traditionally appearing in the department announcements, in a separate series. These have been published since then continuously in the form of handbooks.

But with the other journals--in Hungarian and in foreign languages--the situation is not so simple. The committee clearly stated that among the specialized journals of the Academy a number of the foreign language Acta's are not widely read and have a poor reputation. To put it in the language of scientific measurement their impact factor--which indicates their effectiveness--is between 0.01 and 0.5 (good international journals have a value of 4 to 5, and 0.5 to 1 is barely acceptable). Under such conditions the Acta's do not fulfill their assigned task of introducing Hungarian science. In regard to those Hungarian and foreign language periodicals which deal with specialized Hungarian subjects--for example, the MAGYAR NYELVOR with its great past, SZAZADOK, etc--they stated that their level is uneven, and

moreover they appear with great delays. At that time Professor Straub concluded our conversation by saying that they would take up the subject again in 2 years. The ad hoc committee has in fact now finished studying what has happened in the interim.

"The situation regarding the Acta's," says Bruno F. Straub, "has deteriorated rather than improved. For example, the impact factor of Acta Biochimica et Biophysica, whose editor I am, has fallen from a value of about 1 to a value below 0.5. One of the main reasons for this is that in scientific grading and appointments--correctly so, I think--those results are taken into account which are measured by international scientific opinion, that it, have elicited a reaction. Therefore, everyone--from the beginner to the well established researcher--wants to publish in journals that are the most widely read and have the highest impact factor. To be sure, I could require my subordinates to publish in our Acta, but I do not because I want them also to enter in the "arena." The Acta's publish only articles that have not been accepted in the better journals, the lower quality domestic articles, and articles from several developing countries which are not up to world level and which the "more prominent" journals do not accept."

International Editorial Offices

"Well, what shall become of the Acta's? Shall this type of Hungarian journal be completely eliminated?"

"The Acta's were established in the period of the Cold War when in fact Hungarian researchers were not able to publish elsewhere. The situation today is completely changed, and practically every forum is open to us. I believe that the departments of the Academy should not conduct a critical review and decide which are the ones that are not effective. These Acta's are very expensive. Some, for example, appear in less than 300 copies. It costs the Akademiai Kiado (Academy Publishing House) 30 to 40 million forints annually to publish journals. Those who are opposed to their elimination point out that culture is not merely a commodity. This is true to a certain extent, but if the publisher goes bankrupt it will not be able to support even the better journals. We also have good Acta's. For example, Acta Mathematica--edited by the world famous Hungarian school of mathematics--is both profitable and it also appears on time. And even if certain Acta's are terminated, we do not have to write the obituary of Hungarian journals. Excellent foreign-language journals with a high impact factor appear under Hungarian and international editorship in joint publications of the Akademiai Kiado and foreign firms. I believe this is the course we can follow."

"And what will be the fate of journals specializing in Hungarian subjects?"

"Of course, we cannot and must not eliminate them. But here we need a fundamental renewal and quality change. I believe we must reduce their size. At present they are not capable of collecting adequately good quality manuscripts in the time given. As I have mentioned, publication is becoming increasingly more costly, and thus the journal has to pay the authors less and less. The low-paid workers in the humanities area will understandably

take their manuscripts to those places where they are not only better paid but also have more readers. Thus the specialized journals receive increasingly fewer manuscripts, they find it more and more difficult to collect materials; the delays which occur are charged to the editorial office and the cost is becoming sizable; of course, the printers will also "add on" their share, especially since the Academy printing shop, which was not included in the renovation of the printing industry, is struggling with a constant shortage of skilled workers. In this way delays of several years can also occur."

"The position of the ad hoc committee, I think, has not evoked unequivocal enthusiasm among those affected..."

"No it has not. Opposition is rather great to all kinds of change. To a certain extent this is understandable. Ours is a small country. Editors of journals must have rather great moral courage to reject a manuscript which they think is weak."

Tasks

"As a journal editor, I do so from time to time, but I also know what this kind of attitude results in. However, I believe that the situation would also be improved if the editorial staff of the journals were appointed for a limited period of time in accordance with international practice. and not until they are "removed." The ad hoc committee which I chaired surveyed the situation 2 years ago, and since then it has reported very few well-directed changes, practically speaking only the elimination of the department announcements. Now it is up to the Academy departments and to those responsible for the specialized areas to propose--after considering the possibilities and the difficult economic situation--and to implement changes which on the one hand will raise the quality of domestic journal publications and on the other hand will not require constantly increasing yet unjustifiable state subsidies."

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CSO: 2502/34

POLAND

NEW METAL HARDNESS TESTER FOR INDUSTRIAL USE

Warsaw POMIARY AUTOMATYKA KONTROLA in Polish No 10, Oct 84 pp 302-305

[Article by Jan Szlendak, MS (Eng), and Stefan Zgutka, MS (Eng), Institute of Precision Mechanics, Warsaw: "A Use of Electronic Systems for Automation of Metal Hardness Testing"]

[Excerpts] In this article, the authors propose a method for automatic measurement of the hardness of metal by the Brinell test based on measuring the depth of an imprint and the force pressing the ball into the specimen tested. An instrument set-up implementing this test is described. The equipment can also be used for sorting the tested elements by groups of hardness.

The Brinell hardness test is the legally acceptable measurement method in Poland based on standard PN-78/H-04350. The method is based on the measurement of the imprint field of a ball pressed by a normalized force into the tested material under the observance of certain standard test conditions. The HB hardness is defined by the ratio of the pressure force F to the surface of spherical imprint S [1].

$$HB = \frac{F}{S}. \qquad (1)$$

If the field of the spherical cup is

$$S = \pi Dh, \qquad (2)$$

where D is the diameter of the test ball pressed in and h is the depth of the imprint linked with the imprint diameter d as

$$h = \frac{1}{2}(D - \sqrt{D^2 - d^2}), \qquad (3)$$

then the conventional technique is to measure the diameter d of the imprint by the optical method and compute the hardness according to the expression

$$HB = \frac{2F}{\pi D(D - \sqrt{D^2 - d^2})}. \qquad (4)$$

In the method proposed in this paper, the depth h is measured during the action of the force applied to the ball. The exact measurement of this depth now presents no technical difficulty. In practice, it is difficult to create an invariable measurement base for the probe during the course of measurement, when its surface is imperfectly processed, especially when it is soiled. In view of this, a relative measurement technique is used. It is based on a duplicate measurement of the depth: first, the depth created by initial pressure and then the nominal pressure. The basis for these two readings of depth is the probe element resting on the surface of the tested material and sustaining the force F_0 of approximately 400 N (≈40 kG). This is sufficient force for permanent elimination of the influence of surface impurities of the element and should be constant throughout the measurement cycle.

The depth to which the ball is plunged is measured by an electronic displacement gauge for an arbitrary imprint (measurement). An accurate reading is provided by the difference between two measurements: h_0, the depth of sinking under the action of the initial pressure F_0, and h_1, the depth of sinking under the action of the force F_0 of a specific nominal level [2].

Under this formula it should be clear that the hardness can be calculated easily by digital electronic equipment. Using this principle, the Institute of Precision Mechanics has built the automatic hardness tester TH-3000, illustrated in Fig. 2.

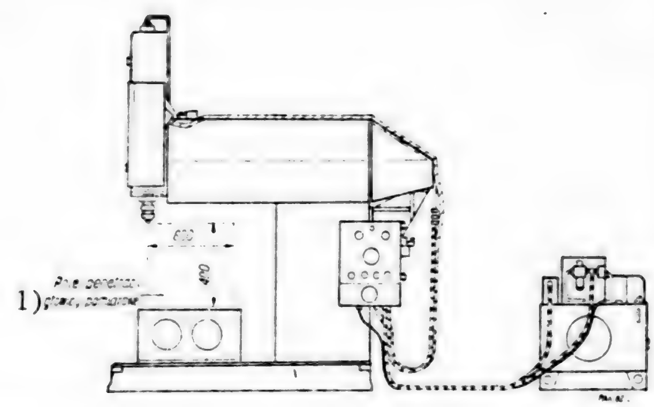

Figure 2. Principal view of hardness tester TH-3000.

Key:
1 - penetration field of measurement head

The hardness tester TH-3000 is both a measurement instrument and a device for sorting the measured elements that can be used in an industrial production line.

As a measurement instrument, it features the accuracy of measurement and convenient readout of results on illuminiated digital display.

As an industrial process device, it allows automatic sorting of elements of certain hardness ranges preset on the control board. The equipment can be used both for single measurements in a manual operation mode and for repeated measurements in a production flow when operated in an automatic mode.

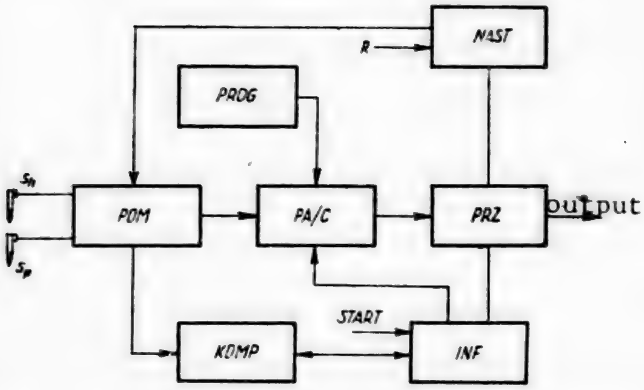

Figure 4. Simplified functional diagram of the measurement system of TH-3000 hardness tester: POM, measurement block; PA/C, analog-digital converter block; KOMP, comparator block; INF, information-address signal block; PRZ, computer block; PROG, programmer block (contacts and permanent memory); NAST, controller block; power block (not shown); s_h and s_p, measuring probes; R, manual setting of selection range of elements being measured.

Main Features of Hardness Tester TH-3000

Operation cycle in manual mode	$T_r = 50$ s
In automatic mode	38 s < T_a < 50 s
Digital readout	999 HB
Range of depth of tester ball imprint	up to 980 μm
Field of access of the probe head to the measurement point	400 x 600 mm
Temperature range	5-35°C
Repeatibility of testing results in specific environmental conditions	over 98%
Inaccuracy of measurement during temperature changes by 10°C	under 5%
Temperature changes of 5°C	under 3%
Diameter of testing ball	10 mm, 5 mm, 2.5 mm
Oil pressure in the hydraulic installation creating pressure at the testing ball, respectively	40 mPa, 20 mPa, 10 mPa
Transport of specimens to measurement table:	

In manual cycle	Top loading tray
In automatic cycle	Roller transporters
Specimen weight	Unlimited
Specimen size	Depending on the access field of tester head
Hardness tester size	2700 x 2600 x 1000 mm
Power supply	3 x 380/220 V, 50 Hz, 3 kW

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CSO: 2602/22

POLAND

NEW DIGITAL AUTOMATIC ELLIPSOMETER FOR INDUSTRIAL, RESEARCH USE

Warsaw POMIARY AUTOMATYKA KONTROLA in Polish No 10, Oct 84 pp 305-306

[Article by Kazimierz Brudzewski, DSc, Solid State Technology Institute, Warsaw Polytechnic: "Automatic Ellipsometer: A Modern Measurement Instrument for Control of the State of Surface and Thin Layers"]

[Excerpts] The author of this article discusses the basic practical parameters of an ellipsometer and the possible applications of this equipment to control production of integrated circuits.

Modern technology of production of discrete and integrated semiconductor elements poses new problems for industrial quality control. A large proportion of modules (according to [1], 15-50 percent) have flaws and errors. An early detection of these defects at the individual stages of the industrial process is important, because it permits substantial reduction of industrial waste. For that reason, interoperational control should be conducted continuously throughout a production process. The epitaxial-planar technology or the microminiaturization of structures and components places stringent requirements as to the control and measurement techniques, namely:

--the need for noncontact, nondestructive measurements;

--sufficient specific localization of tests;

--high accuracy;

--the possibility for automating the control processes.

In the production conditions, these requirements are mainly met by optical methods and, specifically, ellipsometry [2, 3]. Ellipsometry provides for noncontact nondestructive testing of surfaces and thin films in retaining a high accuracy and specific localization of tested areas. The ellipsometric techniques are widely used for control and measurement in epitaxial-planar technology. Ellipsometry is mainly utilized for: controlling the "quality" of the surface of plates, controlling the incremental thickness of the layers of dielectric materials (SiO_2, Si_3N_4) and for controlling the thickness of films utilized as masks in the processes of diffusion of admixtures, as well as for controlling the thickness of layers on individual elements of the microstructures made by photolithographic techniques.

At Warsaw Polytechnic (Departments of Chemistry and Precision Mechanics) work has been conducted for several years to develop designs of ellipsometric equipment. Static and automatic ellipsometers have been developed and put into small-series production. Recently, the so-called digital automatic ellipsometer has been developed, which combines the features of laboratory ellipsometers with those of an industrial ellipsometer. It can be used both for basic research and as a measurement and testing unit in thin film production processes. The automatic digital ellipsometer belongs to the class of so-called self-adjustment units with compensation of polarization state. A block diagram is given in Fig. 1.

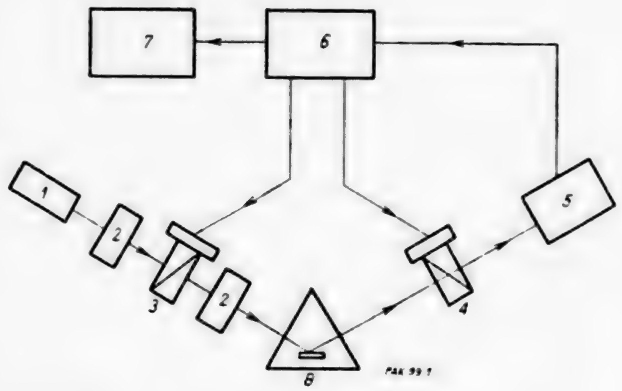

Figure 1. Block-diagram of digital automatic ellipsometer: (1) He-Ne laser; (2) quarter-wave plate; (3) polarizer; (4) analyzer; (5) photodetector; (6) control block; (7) tape punch DT 105S; (8) dish with cover.

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POLAND

AUTOMATED CHEMICAL BATCH PROCESS CONTROL DEVICE

Warsaw POMIARY AUTOMATYKA KONTROLA in Polish No 10, Oct 84 insert CHEMOAUTOMATYKA p 40

[Article: "Microprocessor Control Device μ-Dozomat for Control of Periodic Mix Preparation Systems (A Communication)"]

[Excerpts] The Ministerial Research and Development Center for Automation of Chemical Processes (Chemoautomatyka) offers a microprocessor controller μ-Dozomat for control of periodic operation systems for mix preparation.

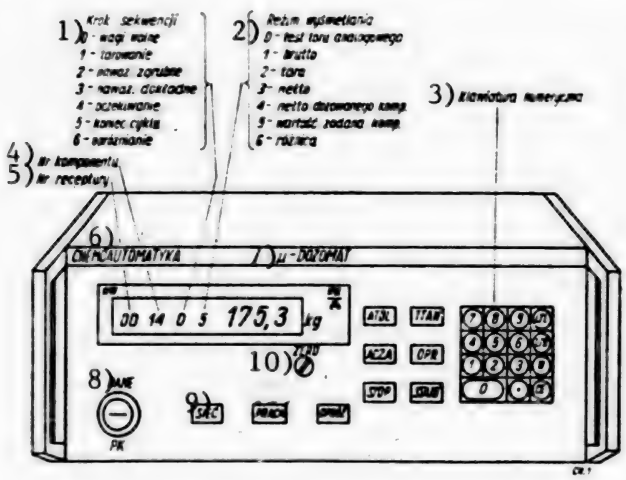

Figure 1. μ-Dozomat control device: WW, indicator of current weight and the desired value; WU, indicator of balance attainment; PK, switch with key for data input; PRACA, manual/automatic control setting button; OPROZ, manual/automatic unloading setting button; ATOL, allowance for weight tolerance; ACZA, allowance for weighing time of the current component; STOP, stop button; TTAN, analog line test; OPR, manual unloading actuator; START, start button; LTL, test of indicator of actuation of all segments; LTB, test of indicator of deactuation of all segments; W, placement in RAM memory; CE, filing of input data.

Key:

1. Procedure step: 0 - scale empty; 1 - calibration; 2 - rough weighing, 3 - precision weighing; 4 - waiting; 5 - end of cycle; 6 - unloading.
2. Display modes: 0 - analog test path; 1 - gross weight; 2 - calibration; 3 - net weight; 4 - net weight of dosed component, 5 - desired value set; 6 - difference.
3. Numeric keyboard
4. Component no.
5. Mix formula no.
6. Chemoautomatyka
7. μ-Dozomat
8. Data
9. Power supply
10. Zero

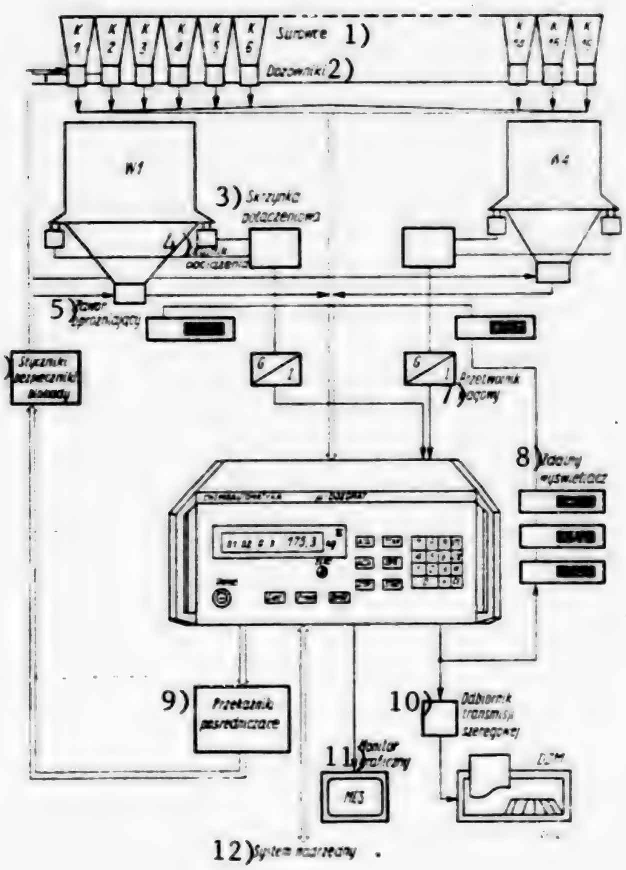

Figure 2. An example of application of μ-Dozomat control device.

Key:

1. Ingredients
2. Dosers
3. Coupling box
4. Load sensor
5. Unloading valve
6. Safety blockage switches
7. Weight processor
8. Remote indicator
9. Mediator relays
10. Serial transmission receiver
11. Graphic monitor
12. Higher-level system

The μ-Dozomat controller (Fig. 1) is intended for sequential control according to a given formula of an installation for periodic preparation of mixes consisting of a maximum of 20 technological units (where a technological unit is either a weighing scale or a container of mix component with a doser). The number of weighing devices is limited to four, but on a special order a system with eight scales is available. There is also an option for expanding the controller to a line with 48 technological units, including eight weighing devices.

The controller is adapted to work with electronic scales using standard input current of 4-20 mA (0-20 mA), such as tensiometric scales manufactured by CZAH (Central Enterprises for Metallurgy Automation) in Katowice or tensiometric devices of Polonia Enterprise Carex in Warsaw, as well as all kinds of dosing units handling granular or liquid materials with two dosage speeds.

Figure 2 shows one possible application of the μ-Dozomat controller.

Basic Features

Number of weighing devices controlled	maximum of 4
Number of weighing and dose dispenser units	maximum of 20
Number of memorized permanent formulas	10
Number of realized formulas	1
Power source	220 V, 50 Hz
Size	438 x 172 x 350
Weight	Approx. 12 kg

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POLAND

NEW ELECTRONIC MEASUREMENT, CONTROL DEVICES

Warsaw POMIARY AUTOMATYKA KONTROLA in Polish No 11, Nov 84 pp 342-346

[Excerpts] The E-320 Automatic Large Capacitance Meter

The instrument serves to measure the capacitance of the loss factor tg δ and the leakage current of tantalum and electrolytic capacitors. During the measurement of the leakage current, the capacitor can be polarized from an internal source with constant voltage regulated continuously from 0 to 100 V, or with a voltage of up to 500 V from an external source. The instrument has a system signalizing the loading state of the capacitor and a system for unloading it.

The meter has two readout fields with LED display indicators:

--3- and 5-digit for measuring the capacitance and the leakage current;

--3-digit for measurement of tg δ and polarization intensity.

The choice of the range for capacitance measurement can be done manually or from outside. The capacitance measurement is performed by the four-point technique in a serial replacement system. The meter with the corresponding interface block can operate in measurement systems according to IEC/ISP II standard.

Technical Features

Capacitance measurement range: 0.2 μF-0.2 F (in six subranges)
Range of measurement of tg δ: 0.01-4.99
Measurement voltage: $\leqslant$5 V
Frequency of measurement voltage: 100 Hz
Range of leakage current measurement: 0.01 μA-10 mA (in five subranges)
Polarization intensity: 0-10, 0-100, 0-500 V (externally)
Principal error of capacitance and leakage current measurement: ±2 percent
Parallel digital outputs in BCD code standard TTL:
--C and tg δ or U_{pol} and U_{leak}
--set function
--measurement subrange
--passing outside the subrange
Control signals B0, B1, B2, M1 and M2 according to Polish standard PN-76/T-06533

Programming signals:
--programming of remote/local control
--programming of measurement function
--programming of measurement subrange
Power supply: 220 V ± 10 percent, 50 Hz
Instrument size: 297 x 350 x 140 mm
Weight: about 8 kg
Manufacturer: Meratronik Automation and Measurement Instruments Factory, 42 Al. Bohaterow Warszawy, 70-342 Szczecin
Domestic distributor: Merazet BZSPK Poznan.

Word Processor Minisystem MiXS TP M 240 R

This is a modular multiprocessor minisystem for text processing (including multilingual texts).

Basic Applications

Preparations (editing and corrections) and archival storage of text at newspaper and book publisher offices.

Generation and archival storage of documentation (including technical documentation).

Correspondence in foreign languages.

Calculations of management data.

Techical Features of Equipment (Structure)

Central processor package (CPU).

Dynamic memory package (DOM) 128 kB.

Graphic monitor control module (GDC): controls the graphic monitor, keyboard, light pen and printer.

Package for floppy disk memory controller (MDC).

Package of control of cassette disk memory 5/10 MB and floppy disk memory (HFC).

Controller package for minicomplex computer channel JS (MXC).

Controller package of local network interface (ETC) of Ethernet type.

Controller package of communication interface (CIC) with channels V-24 (current loop) that can work with exponders. The exponders include: additional channel V-24, instrument interface ITC 625 or paper tape interface STPT-3.

Input/Output Devices

Noncontact keyboard, 135 keys.

Monitor screen, 20-inch diagonal.

Matrix graphic dot printer.

Memory mechanisms on floppy disks type MF 6400 or PL x 45D.

Memory mechanisms on cassette disks type SM 5400/5410.

Uniform system modem, for example, EC 8013.

Minisystems MiXS TP connected through interface with local network.

Operation Conditions

One-phase current, 220 V, +10 percent, 15 percent, 50 Hz.

Maximum power consumption, about 1.5 kV•A.

Operation temperature, 5-40°C.

Relative humidity, 40-90 percent.

Manufacturer: Precision Mechanics Enterprises Mera-Blonie.

SAPOS-1 System of Point Measurement of Semiconductor Structures

The measurement system SAPOS-1 has been developed and produced by Mera-Obreus at Torun as a part of the project in developing technology of production of integrated pressure sensors based on documentation provided by Honeywell. The system is intended mainly for automatic point measurements of pressure sensors. It can be also used to test other semiconductor structures.

General Characteristics

The main function of the measurement system SAPOS-1 is to test the electrical parameters of semiconductor structures on a silicon plate. The point measurements are made by automatic multipoint tester AVT110 (manufactured in the GDR). The SAPOS-1 also includes the following functional blocks:

--multiplexer of measurement tests MPXA;
--digital multimeter V543;
--digital voltmeter V544 or V542;
--minicomputer system Mera 400 with a complex of peripheral devices (DZM 180 KSR printer, Mera 7954 screen monitor, floppy disk SP45DE, tape reader CP2000, printer DT105 or plotter KL2).

The overall block diagrams are represents in Figs. 1 and 2.

Conclusions

Thanks to its ramified hardware and software, the measurement system SAPOS-1 is a universal equipment that can be used for research and for building a standard testing station in the production of semiconductor circuits.

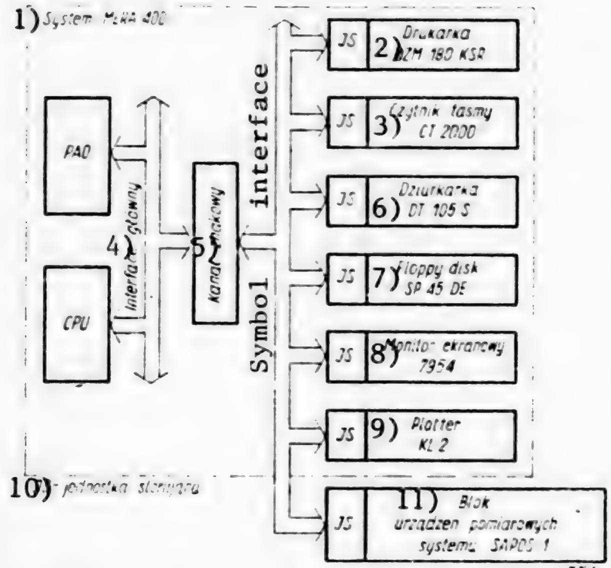

Figure 1. Flowchart of SAPOS-1 system.

Key:

1. Mera 400 system
2. Printer DZM 180 KSR
3. Tape reader CT 2000
4. Main interface
5. Symbolic channel
6. Printer DT 105 S
7. Floppy disk SP45DE
8. Screen monitor 7954
9. Plotter KL2
10. Control unit
11. Block of measurement devices of SAPOS-1 system

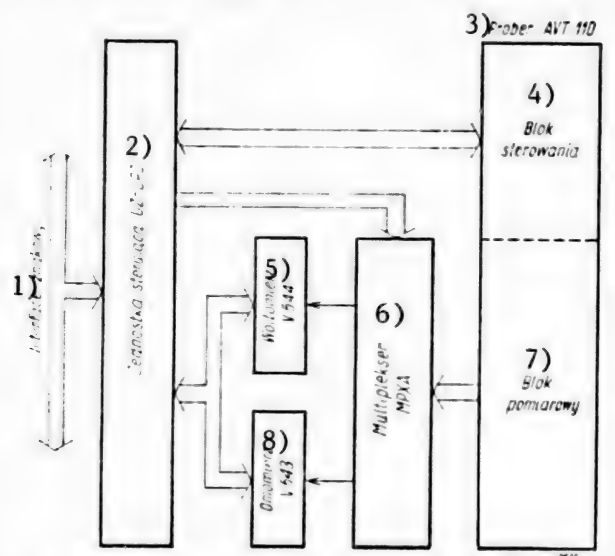

Figure 2. Expansion of the block of measurement devices of SAPOS-1 system.

Key:

1. Symbol interface
2. Control unit UZ-UPS
3. Tester AVT 110
4. Control block
5. Voltmeter V544
6. Multiplexer MPXA
7. Measurement block
8. Ohmmeter

Its capabilities include: classifying circuits or batches for different boundary conditions, estimating gain, evaluating the distribution of measured parameters on plates, graphic representation of distribution, fast calculation of characteristics of a batch of circuit plates. These capabilities make the system suitable for research purposes. In view of its high productivity, the capability for sorting structures, statistical calculations and storage of structural data in a file, the system can also be used as a standard testing station in a production line.

Manufacturer: Research and Development Center of Specialized Electronic Systems--Mera-Obreus, 46 Grudziadzka Street, 87-100 Torun, telephone 330-45.

MEUS-808 Flexible General-Purpose Microprocessor System

The MEUS-808 general-purpose microprocessor system is a modular microcomputer built around the INTEL 8080 or a similar functional unit. Due to its modular structure, the specific system configuration can be tailored to the particular requirements of the user and the necessary functions.

The MEUS-808 system can be used for computer-assisted design and testing of simple problem-oriented systems. It can also be employed for training purposes. When combined with an object interface it can also operate as a controller in automated operations.

Manufacturer: Research and Development Center of Specialized Electronic Systems--Mera-Obreus.

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RESEARCH ON CAD/CAM SUPPORT FOR MICROPROCESSOR DEVELOPMENT SURVEYED

Gydnia PRZEGLAD MORSKI in Polish No 12, Dec 84 pp 58-66

[Article by Dr. Wlodzimierz Soinski: "Microelectronics: CAD/CAM Systems and Microcomputer Systems"]

[Text] What is the current state of development of microprocessor technology in Poland? Can one answer this question in full? A complete answer would have to cover many aspects and various external decisions. However, if we decide to be confined to technical aspects alone, then--according to the conventional subdivisions--we should ask about the state of the production of hardware, software and applications. In view of the historical importance of this technology, one should be primarily concerned with the development of applications of microprocessors in products and systems. Such applications call for hardware that would make them possible. This leads to the next question: With what and of what is it built? "With what" is a question of tools--from oscilloscope and analyzer to implementation means from CAD/CAM systems to cross software.[1] From this spectrum of tools of different degrees of complexity--from built-in system elements to pure software--we consider below selected CAD/CAM systems that find applications in the navy.

Effecting the application of a microcomputer (or a system) executing specific functions currently is a protracted process which involves a large number of iterations necessary for error elimination. This happens because the errors result from inadequate preparation of the project at stages preceding the implementation, for instance, because of incomplete or not formalized specification of requirements.

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[1] Cross software is the basic software that has an auxiliary instrumental function (such as assembler, compiler, simulator) which makes it possible to interpret or bring into operation programs of a different (micro) computer than the host computer for which they were created (author's note).

CAD/CAM Systems

For design and application of microprocessor systems, special hardware and software tools are used (as has been mentioned before), which are called auxiliary systems or CAD/CAM systems. These auxiliary tools perform a number of functions, including[2]:

--design, implementation and testing of microprocessor hardware component;

--design, implementation, testing and verification of software;

--integration of hardware and software.

The degree to which these requirements are met can be a criterion for dividing the auxiliary systems into three categories[3]:

--simple microcomputer configuration;

--systems for development of software and modeling in the application of the auxiliary system;

--eight systems for software development for integration of hardware and software on the basis of system emulation.

These auxiliary CAD systems of the third class make it possible to integrate hardware and software directly in the application of a working system. Usually, these include:

--microcomputer with permanent memory and with working memory depending on the configuration (so-called extendable);

--a well-developed input-output system;

--large floppy disk memory (with a disk operative system).

These elements, which aid in the creation of software, are combined with a system emulator. The concept of system emulation involves the simulation of the work of a microprocessor in an actual system (that is, an implemented real system) by a configuration comprising a similar microprocessor and logical elements allowing its monitoring and control. During the course of adjustment, the microprocessor is replaced by a probe of the emulator system. As a result, it becomes possible to adjust the system in the required configuration to real conditions of its operation without the need for introducing into the structure special facilities that are in fact only needed during the course of this adjustment.

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[2]M. Konsek, Cz. Paulus, and W. Trojnar, "Rozwoj srodkow wspomagajacych projektowanie i uruchamianie systemow mikroprocesorwych" [Development of auxiliary tools: Design and implementation of microprocessor systems], Preprint, Zadklad Systemow Automatyki Kompleksowej, PAN, Gliwice, 1980.

[3]Ibid.

The CAD/CAM systems with these capacities include RTDS-8 (Real Time Development System 8) developed by the Institute for Complex Automatics of the Polish Academy of Sciences, Gliwice. It is a modular system intended for design and implementation of assemblies equipped with a general-purpose eight-bit microprocessor emulator. The available set of modules[4] and the software system of RTDS-8 make it possible to design and adjust confiugrations based on Intel 8080 and 8085 microprocessors.

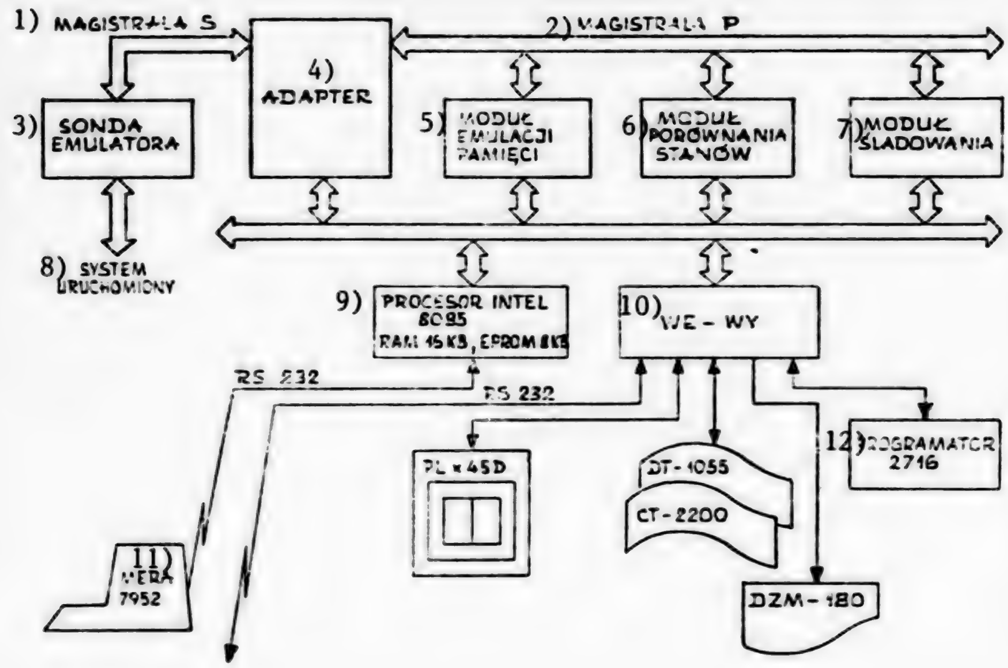

Figure 1. Block-diagram of RDTS-8 system.

Key:

1. Main line S
2. Main line P
3. Emulator probe
4. Adapter
5. Memory emulation module
6. State match module
7. Monitoring module
8. Implemented system
9. Intel 8080 processor; RAM 16 KB, EPROM 8 KB
10. Input/output
11. Mera 7952
12. Programmer 2716

The RTDS-8 system consists of two basic functional blocks: microcomputer and universal eight-bit microprocessor emulator (Fig. 1).

[4] According to data as of Jan 1, 1984 (author's note.)

The microcomputer block is a two-modular universal microcomputer system (processor module and interface module). It is equipped with an Intel 8085 processor and has a minimum RAM memory of 16 KB and a maximum of 8 KB EPROM memory. The interface module serves to link the system with external devices such as:

--display screen monitor (e.g., Mera-7952) used as the system control terminal;

--floppy disk memory station (PLX45D);

--dot matrix printer (DZM-180);

--paper tape reader and punch (CT-2000 and DT-105s or SPTP-3 station);

--EPROM memory programmer type 2716;

--computer system with cross software.

The software of the RDTS-8 makes it possible to execute the entire cycle of design of software for an application system. The editor and assembler are responsible for preparing the program text, translating it and for the output of the program recorded in the disk memory. The emulation program (Emulator) serves for interactive continuation of the process of program adjustment in the user configuration.

Further work on the RTDS-8 system[5] will be carried on along two main lines. First, there are plans to connect the system to a set of compilers of higher-level languages--Fortran and PL/M--and increasing the group of emulator microprocessors by developing adequate modules (adapter and probe), as well as control programs.

The Microprocessor CAD/CAM System (MSWS)[6] is a universal tool for design, adjustment and testing of microprocessor systems. It is a modular system consisting of a large group of hardware and software elements used for design and adjustment of microprocessor units built of Intel 8080 and Intel 3000 units or their substitutes (for instance, systems of K580 and K589 processors made in the USSR). The modular structure of the system makes it possible to adapt it to the design of equipment based on different types of microprocessors. In functional terms, the MSWS is similar to other systems such Intellect MDS8000 (Intel) or Tektronix 8002 (Microprocessor Lab).

The basic operational blocks are located in a central unit connected to input/output devices, floppy disk memory and the applications systems being

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[5]The production of the RTDS-8 system is done by Mera-Elzab Computer Equipment Enterprises at Zabrze (author's note).

[6]This system was developed by the Institute of Mathematical Machines in Warsaw. In 1983, it was introduced into operation in the informational series (author's note).

designed. Depending on the needs and available facilities, MSWS can be assembled in alternative configurations. This is possible thanks to the modular structure of operational blocks and the input/output devices that allow the use of various types of external units.

The Prompt-48 System of Intel is intended for self-programming of EPROM memory of one-system Intel 8748 microcomputer and for adjustment of programs written for this microcomputer.

The HSE-49 (High Speed Emulator) System is a two-processor combination consisting of emulation processor and a supervisor. Functionally, the HSE-49 is an extension of the Prompt-48. Most functions are identical in the two systems.

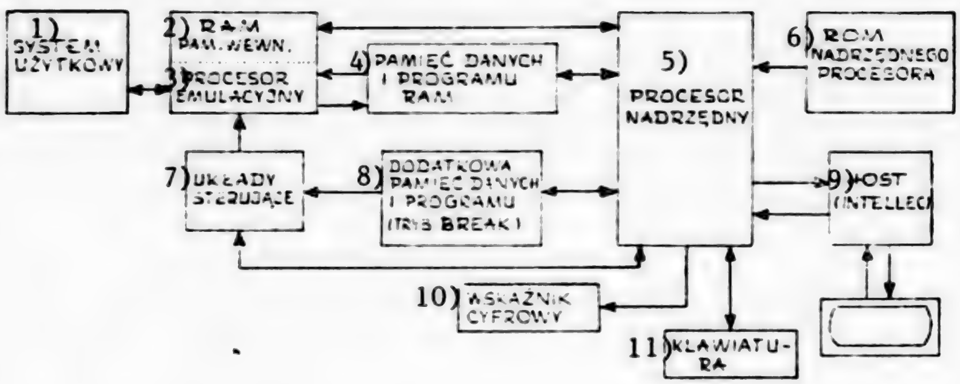

Figure 2. Block-diagram of the HSE-49 system.

Key:

1. User system	7. Control systems
2. External RAM memory	8. Additional data and program memory (break mode)
3. Emulation processor	
4. Data and program RAM memory	9. Host (Intellec)
5. Supervisory processor	10. Digital display
6. Supervisory ROM processor	11. Keyboard

The Institute of Electronic Technology of the NPCP[7] has developed a system for adjustment and testing of programs and for system emulation performed in real time: EMU-48 for micromputers of MCY 7848/35 family. This is a one-processor system which includes microcomputer MCY 735 (an equivalent of the Intel 8035) and its functional blocks:

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[7]Naukowo-Produkcyjne Centrum Polprzewodnikow [Semiconductor Research and Production Center].

--2 KB RAM memory (for the program);

--256 KB RAM memory (for data);

--auxiliary devices MCY 7855, MCY 7851 (or, respectively, Intel 8255 and 8251) and Intel 8279.

For most applications,[8] Prompt-48 and HSE-49 systems can be used, as well as implementation device for MCY 7348/35 microcomputer family. Thanks to a compromise between the limitations of simple design and the desired functional capabilities of the system, an efficient and inexpensive solution has been obtained that is suitable for a broad spectrum of users. Relatively greater capabilities are possessed by the HSE-49 system, which is more complex in terms of its hardware. An advantage of the Prompt-48 is its capacity for EPROM program memory, but it has a weaker emulation capacity.

Introduction to the markets of large-scale integration circuits, mainly microprocessors and the programmed devices operating with them, offered a new range of applications of computer technology and also posed a number of new problems. In particular, there arose the need for implementation and testing of application configurations comprising these integrated circuits. The foregoing review of selected CAD/CAM systems gave an answer to the question of tools asked at the beginning. We will now try to answer the second question, that of material. A future user of microcomputer systems will find in the following section a limited review of the status of the more advanced domestic projects.

Microcomputer Systems

The Mera-Ster Research and Production Center of Control Systems at Katowice started in 1979 the production of Mera-60 microcomputer intended for control of industrial processes and engineering calculations. The system was developed in a joint project with the Soviet Union and is based on large-scale integration circuits made in the USSR, as well as components produced domestically. It is equipped with Polish peripheral devices, as well as domestic interface units. The Mera-60 system has been developed and modernized continuously, both in terms of hardware and software. Continued development of the functional features of this system is envisioned.

The Mera-60 is a modular microcomputer based on modern semiconductor MSI or LSI elements. The central component is a trunk line comprising 16 data and address lines and 23 control lines. Connected to the trunk are processor, memory modules and selected standard or special modules designed according to user requirements. The system architecture is illustrated in Fig. 3. Without going into technical specifications, the following electronic

[8] As far as the functional capabilities are concerned, two systems mentioned above (RTDS-8 and MSWS) were not discussed because they appeared in the informational series and are less accessible (author's note).

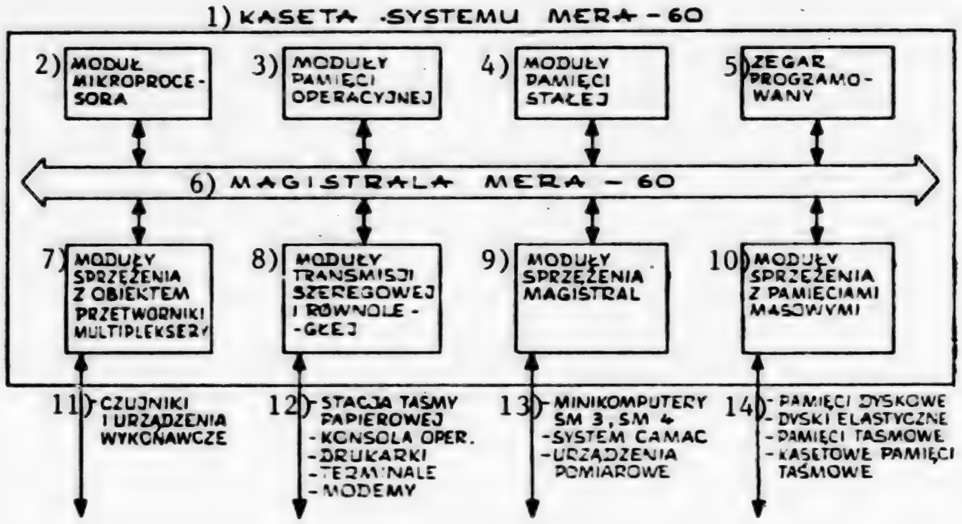

Figure 3. Architecture of the Mera-60 system.

Key:

1. Casette of Mera-60 system
2. Microprocessor module
3. Working memory module
4. Permanent memory module
5. Programmed clock
6. Mera-60 main line
7. Object interface module; multiplex converters
8. Serial and parallel transmission module
9. Main line interface module
10. Module of interface with mass memory units
11. Sensors and working organs of equipment
12. Paper tape station
    Operator keyboard
    Printers
    Terminals
    Modems
13. SM 3, SM 4 minicomputers
    CAMAC system
    Measurement instruments
14. Disk memories
    Floppy disks
    Tape memories
    Cassette tape-memories

modules of the Mera-60 can be mentioned by way of example:

--processors (M1, 16-bit single-plate unit; M2, M1 processor extended for arithematic instructions and floating decimal point);

--working memory (P1, dynamic semiconductor memory, 4 kilowords, requiring additional control signal; P2, the same, but without the latter requirement);

MDP-60/8 (dynamic semiconductor memory, 8 kilowords on a common package; MPD-60/16, with 16 kiloword capacity);

--permanent memory (MPR-60, ROM semiconductor memory, capacity 256, 2 kilowords (or 256 words) or 512, 2 kilowords (or 512 words)), depending on the elements used; MPE-60, EPROM memory 1 K, 8 kilowords (or 1 K) or 2 K, 16 kilowords (or 2 K), depending on the elements used;

--programmed real time clock;

--interface modules with the object (MWW-60, an input/output digital module for 16 unbuffered data lines; MUX-60, multiplexer module of 64 two-state bit-organized inputs (64 x 1) or byte-organized inputs (8 x 8); MDX-60, digital input/output module; unbuffered (2 x 16 inputs) and buffered (2 x 16 inputs) data lines with 16 control signals and 4 external signals that can cause interruption);

--transmission modules (MDK-60/1, the basic modules of serial transmission with capability for selection of transmission speed and number of stop bits; MDL-60, serial transmission modules with capability for switchover to current loop transmission; MMT-60, four-track serial transmission module; MLP-60, module for parallel transmission of eight-bit words for communication with symbolic devices operating in start-stop mode furnished with additional signals for cooperation with DZM-180 printer).

According to the classification of the technological facilities of unified system of small digital machines SM, the Mera-60 microcomputer belongs to the second generation of digital machines in the class SM 50/50-3. According to the plan of the Council of Chief Designers of the System of Small Digital Machines SM, so-called third-phase computers will be produced in 1985-95. According to the plan, they will have the following features:

--reliability increased by an order of magnitude;

--design adapted to multiprocessor operation and operation in a computer network with mechanisms enabling parallel programming;

--operation parameters improved by an order of magnitude;

--new types of terminals and memory devices;

--software compatible with that of predecessor systems.

At the Institute of Control Systems, work has been strated on expanding the Mera-60 system to the Mera-60/256 system.

The Mera-60 microcomputer is certainly a new element in the development of Polish computer technology. It greatly enlarges the capability of realization of control systems in industry, transport, medicine and other fields. The modular design makes it possible to upgrade the system continuously (both in terms of hardware and in its software). The implementation of the production plans for the Mera 60-256 microcomputer will require (in addition to design and programming work) basic actions toward

modernization of technology in microcomputer equipment manufacturing. Only if modern technology of production is introduced will it be possible to ensure the required functional reliability of this equipment and to reduce its cost.

CAMAC is a universal modular electronic system used for automation of measurement processes in scientific experiments, as well as in industrial control. Due to the possibility for creating all kinds of functional configurations, CAMAC equipment has broad applications in various areas of science and technology. The CAMAC systems allow bilateral communication and transfer of information between measurement devices and a computer or other control units. The modular design of the system provides for an easy modification of measurement elements of CAMAC. The measurement equipment is made of individual functional units placed in special cartridges. The CAMAC system allows building multicartridge configurations by linking the individual cartridges through external trunk line or the use of several computers. It is also possible to use several control sources within a cartridge. This novel concept of CAMAC equipment, termed the system of decentralized intelligence, offers a basis for developing configurations with greatly enlarged user capabilities. Adapting the equipment to operate in a standard electronic system such as CAMAC presupposes a rigorous observance of norms concerning the mechanical design and the logical organization of the system. In many cases, this creates unjustified systematic and mechanical complications. A much simpler and cheaper solution in this situation is to use universal systems that can easily be adapted to specific needs. Universal microcomputers of broad capabilities are ideal for this purpose. They also allow easy modification of operation algorithms by changes in the control program.

The concept of modular construction of microprocessor controllers is implemented by many firms involved in industrial applications of microprocessors. The need for developing a uniform design basis for the construction of controllers of industrial lines is dictated by the requirement of reduced design and implementation time, their improved reliability and adequate conservation conditions.

The modular system of microprocessor controllers--Mikroster, developed by the Institute of Industrial Electronics--allows designing program controllers and the construction of CAD/CAM systems necessary for implementation and testing of user software. Its functions include:

--control of industrial lines and equipment;

--control of measurement and monitoring equipment;

--preparation and implementation of application software;

--data processing.

This system has been implemented on the basis of components of the Intel 8080 family. In designing it, effort was made to utilize as many domestically produced components as possible. The functional package blocks are subdivided into the following groups:

--basic packages of the central unit of multifunctional microcomputers, RAM and EPROM memories, relocated EPROM memories, joint operation with external devices and step-by-step procedures;

--specialized packages of the EPROM memory programmer, keyboard and display services, control of cassette memory PK-1 and control of floppy disks;

--software for linkage with the object: input and output, two-state devices 24 V, control of step drives, control of DC drive and coupling with two digital-analog converters DAC 44 and DAC 45.

To simplify design and implementation of microprocessor systems and configurations, the Institute of Informatics has developed a modular microprocessor system (MSM). This system found applications primarily in training, because it makes possible designing and realizing composite microprocessor configurations in a short period of time. On the basis of the MSM system, brought into production at the experimental section of the Institute of Informatics, a large number of equipment units and specialized systems have already been developed. First developments and projects initiated outside of the institute are also under way. The modular structure of the MSM system makes it possible to create various configurations depending on user needs. Thanks to the application of main trunk buffers, the standard modules can be adjusted for operation in extended systems. In some applications, modules developed by the users themselves may be utilized. In designing such modules, the customer can make use of universal modules or standard systems for joint operation with the mainframe. Currently, a series of new standard modules is being developed, including:

--modules of special processors (arithmetic, graphic, communications);

--module of monitoring and control of physical processes (digital-analog and analog-digital converters, amplitude-frequency and frequency-amplitude converters, analog multiplexers and digital input and output devices with galvanic isolation). Development of tools facilitating the implementation and testing of microprocessor systems is also in an advanced stage (simulators, emulators, etc.).

Currently, the MSM systems are utilized in the development of specialized equipment for analysis of analog signals in medicine (myograph), geophysics (exploration of oil deposits) and industry (monitoring of industrial processes). Work on local microprocessor networks is also being conducted.

Summary

In the future, so-called professional, applications of microprocessor technology, the universal nature of this equipment will be of a major importance. This involves both the possibility of extending the basic configuration by purchasing or devising new modules to meet the increasing requirements or expansion of functions, as well as the possibility of coupling this equipment into larger systems and linking them with other existing installations.

Obviously, the creators of these designs are well aware of this.[9] Although each of the systems under review has a modular structure and is expandable, they are incompatible. There are no interlinks between these systems--neither in terms of mechanics or electronic circuits nor their logics. The logical organization of each of the systems is entirely self-contained. One can understand that the Mera-60 system stands apart. But all the other configurations are based on the Intel 8080 microprocessor. The possibilities of linking these types of equipment into larger systems are also limited. Although each is equipped with modules for communication through standard equipment (interface)--V24--which is a basic requirement for the design to survive at all, this, however, is sufficient for communication with one computer. It is doubtful, however, that that would be sufficient for creating large composite configurations, whether multiprocessor or microcomputer networks. And yet, this should not be viewed as an entirely remote perspective. Currently, only CAMAC allows the possibility of a standard realization of such assemblies. But it too has its limitations, both in terms of the trunk line (overly complicated) and as far as the requirements of network structures are concerned (it it not adapted to this use). It should be pointed out, however, that the problems of so-called distributed intelligence systems or simply microcomputer networks will soon become the main focus of computer design.[10]

Finally, it should be underscored that, along with the development of software engineering, the implementation and computer-assisted design of microcomputers will no longer be conceived in the narrow sense it has been until now. One path toward improving the conventional CAD/CAM systems is integrating them with cross software systems (specifically, in our conditions) developed on computers of the series SM, Odra, Mera or Ryad. Although cross software is more effective than CAD/CAM systems, it alone does not provide a solution, because it fails to accomplish their basic function, namely, it does not ensure integration of hardware and software.

In conclusion, one cannot remain, in the light of the above facts, a "complacent optimist." A shortage in the development of CAD/CAM systems causes stagnation in microprocessor technology. This gives little cause for optimism in a situation which has been described as a game where a partner without a trump simply does not count. The trump card in the development of microprocessor technology is CAD/CAM systems, as much as microelectronics is the trump card in our nation's economic progress.

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[9] "... The need for development of standard basis for the construction of units controlling equipment and industrial production lines follows from the necessity for reducing the design and implementation cycle, increasing reliability of technology and ensuring the adequate conservation conditions." S. Koslacz and K. Rzymkowski, "CAMAC: A block electronic system for automation of measurement and control," INFORMATYKA, No 2, 1980, p 14.

[10] In a subsequent issue of PRZEGLAD MORSKI, this range of problems is discussed in terms of possible management applications (author's note).

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POLAND

MATERIALS COMBUSTIBILITY TESTING FOR UNDERWATER WORK ENVIRONMENTS

Gdansk BUDOWNICTWO OKRETOWE in English No 1, Jan 85 pp 15-18

[Article by Dr Inz. Tadeusz Kukula and Dr Zygmunt Sychta, Szczecin Technical University Ship Research Institute: "Investigation Into Combustible, Smoke-Producing and Toxic Properties of Nonmetallic Materials Designed for Use in an Underwater Work Complex"]

[Text] A complex for research and underwater work in great depths consists, apart from a special-built base ship, of the following main elements [1]:

1) decompression chamber,
2) deep-sea diving bell,
3) special technical equipment systems which ensure the staff proper living conditions and comprise:
   — a system of flow and treatment of breathing mixtures,
   — a system of check-and measuring apparatus,
   — systems of fixed fire signalling-detecting and fire extinguishing installations,
   — a rescue system.

Also underwater vehicles usually controlled from the deep-sea diving bell through conductors can go into the making of such a complex.

Fire and explosion hazards of the research and underwater work complex, particularly of the decompression chamber, result from many complex reasons such as e.g. [1, 2, 4]

a) presence of combustible non-metallic materials constituting structural members, heat-insulating and outfit elements, also staff's personal things,
b) constitution of breathing mixtures containing, among others, oxygen of a partial pressure increased in relation to the normal pressure (oxygen enriched atmosphere),
c) possibility of occurrence of potential sources of ignition (e.g. conductors and various electrical equipment),
d) construction of decompression chamber and its techno-operating condition.

Research work in the sphere of ocean engineering and the construction of a research and underwater work complex at SZCZECIN Shipyard have necessitated intensive works and research to be done, among others, in combustible and toxic properties of home-made materials under conditions of the oxygen enriched atmosphere at a high pressure [1, 3].

It should be noted at the same time that working out of sufficiently exact mathematical models describing the course of phenomena and processes accompanying the behaviour of materials at raised pressures, particularly in the interspheres of the breathing mixtures, has up to now failed. The so far worked out mathematical models introduce considerable simplifications and the models of combustion and flame spread on the surface of the solids can be used only for homogeneous materials having a simple

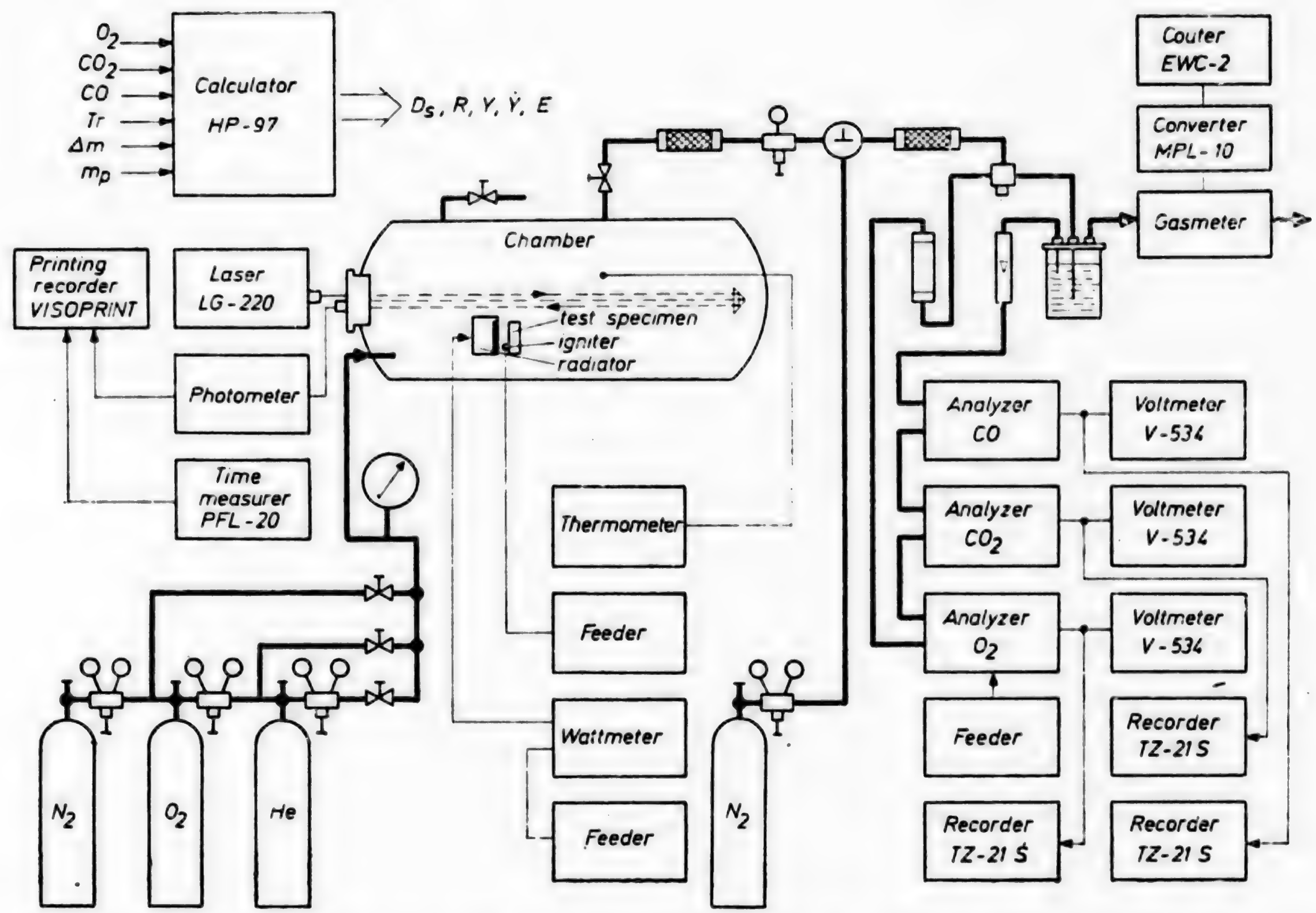

Fig. 1. Schematic diagram of the stand for testing the combustibility, toxicity and smokiness of shipborne materials under conditions of the oxygen enriched atmosphere

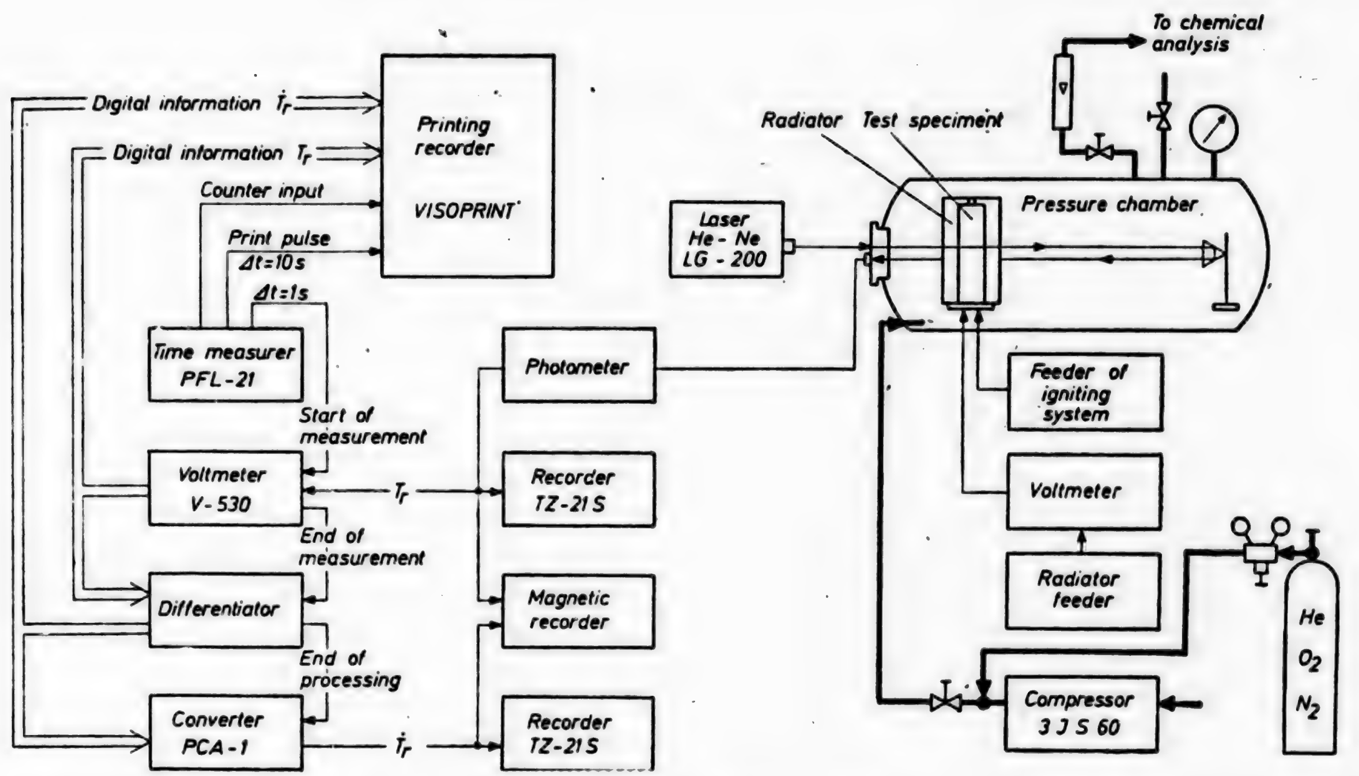

Fig. 2. Schematic diagram of the stand for testing the smokiness of non-metallic materials designed for the construction and equipment of ocean engineering objects (decompression chamber, deep-sea diving bell)

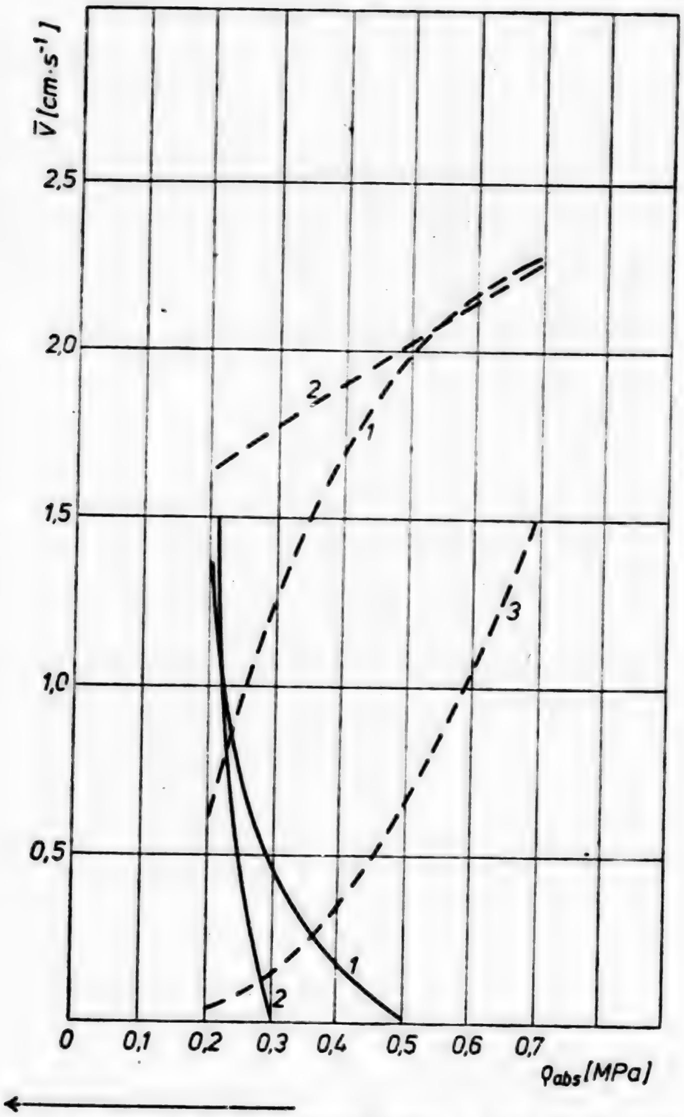

Fig. 3. Dependence of the average velocity of the surface spread of flame "V" on the pressure of gaseous mixtures in the model chamber of the decompression chamber
1 — hardboard, 3.2 mm thick, 2 — leafy plywood, 10 mm thick, 3 — shipboard, 10 mm thick, – – – – air, ——— breathing mixture O_2-He-N_2

chemical structure, a defined thickness and an assumed considerable number of physico-chemical parameters [1, 4].

Hereunder some selected finding obtained from the recent research done in 1983 and 1984 in the Establishment for Ship's Technical Protection of the Ship Research Institute at SZCZECIN Technical University are presented.

MEASURING APPARATUS

Figs 1 and 2 show the schematic diagrams of original measuring sets of authors' design and make of the Establishment referred to, adapted for testing the combustibility, smokiness and toxicity of non-mettalic materials designed for the construction and outfit of the decompression chamber and deep-sea diving bell.

These sets are intended for testing the materials in the interspheres of the air and breathing mixtures O_2-He-N_2 at pressures up to 0.7 MPa.

Basic technical data of the measuring sets:

a) volume of pressure chamber — $\sim$45 dm^3 (Ø 300 × × 750 mm)

b) power of igniter — 50 W

c) power of radiator — 840 W

d) intensity of irradiation of tested material specimens — 12 kW · m^{-2}

e) intensity of flow of air or breathing mixture (for standard conditions) — 35 dm^3 h^{-1}

f) size of tested material specimens — 160 × 25 mm

The tested material specimens were made fast in a special holder in vertical position, the igniter was located on the lower edge of the tested material specimen [4].

The constitution of the breathing mixture O_2-He-N_2 has been established like for the actual systems applied in the decompression chamber, additionally checking the share of particular constituents for the determined measuring pressures [4].

For chemical microanalyses of the constitution of the combustion products in the pressure chamber use was made, among others, of the GDR-made analyzers: INFRALYT 4 and PERMOLYT 2. For a detailed description of the methodology of testing see work [4].

ANALYSIS OF OWN FINDINGS

In Figs 3, 4, 5, and 7 the influence of the pressure and that of the kind of intersphere of the pressure chamber upon the thermal properties of a few selected materials under conditions of their thermal decomposition and combustion can be seen comparatively. The findings:

a) Vertical position of the material specimen and location of the source of ignition on the lower edge of the specimen cause — in comparison with another location of these elements — a strongly marked increase in the velocity of the surface spread of flame and in the mass velocity of the combustion.

b) In case the pressure chamber would be filled up with air the increase in the pressure involves:
   - an increase in the velocity of the surface spread of flame and in the mass velocity of the combustion,
   - a growth of the emission of carbon monoxide and carbon dioxide,
   - a loss of oxygen and growth of the intensity of smoking.

c) In case the pressure chamber would be filled up with the breathing mixture O_2-He-N_2 an inverse phenomenon is observed i.e. the increase in the pressure causes a strongly marked reduction in:
   - the velocity of the surface spread of flame and in the mass velocity of the combustion,
   - the emission of carbon monoxide and carbon dioxide,
   - the intensity of smoking.

Under conditions determined in item "c" the action time of the igniter, indispensable for inflaming the tested material specimen, extends as the pressure increases.

The fact that the measurement is restricted to the emission mainly of carbon monoxide and carbon dioxide — with ignoring other toxic combustion products — is due to the general trend to adopt the carbon monoxide as the basic and most dangerous gaseous constituent of the combustion products. The threat of human subjects with many gaseous products of combustion of the shipborne nonmetallic materials is highlighted in detail in works [4, 5].

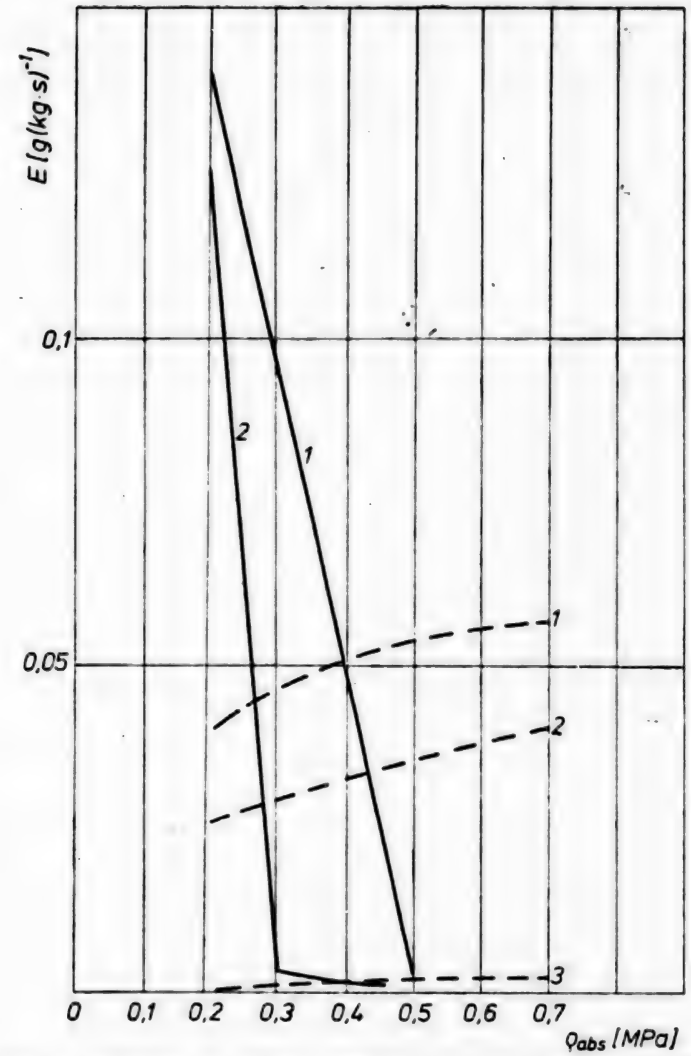

Fig. 4. Emission of carbon monoxide in the function of the pressure of gaseous mixtures in the model chamber of the decompression chamber

1 — hardboard, 3.2 mm thick, 2 — leafy plywood, 10 mm thick, 3 — shipboard, 100 mm thick, – – – – air, ——— breathing mixture O_2-He-N_2

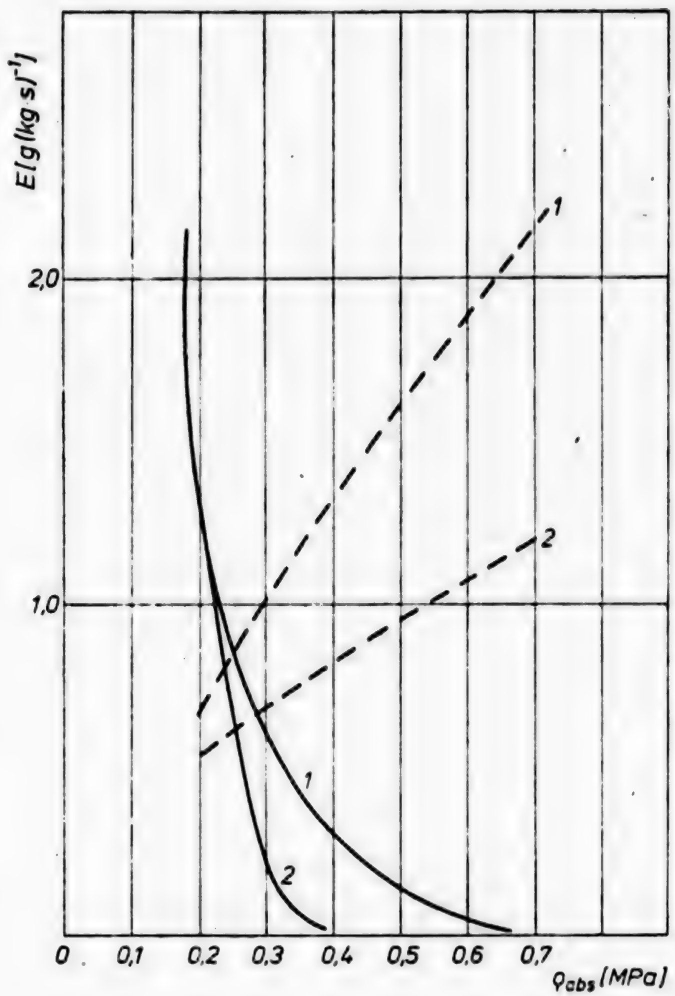

Fig. 5. Emission of carbon dioxide in the function of the pressure of gaseous mixtures in the model chamber of the decompression chamber

1 — hardboard, 3.2 mm thick, 2 — leafy plywood, 10 mm thick, – – – – air, ——— breathing mixture O_2-He-N_2

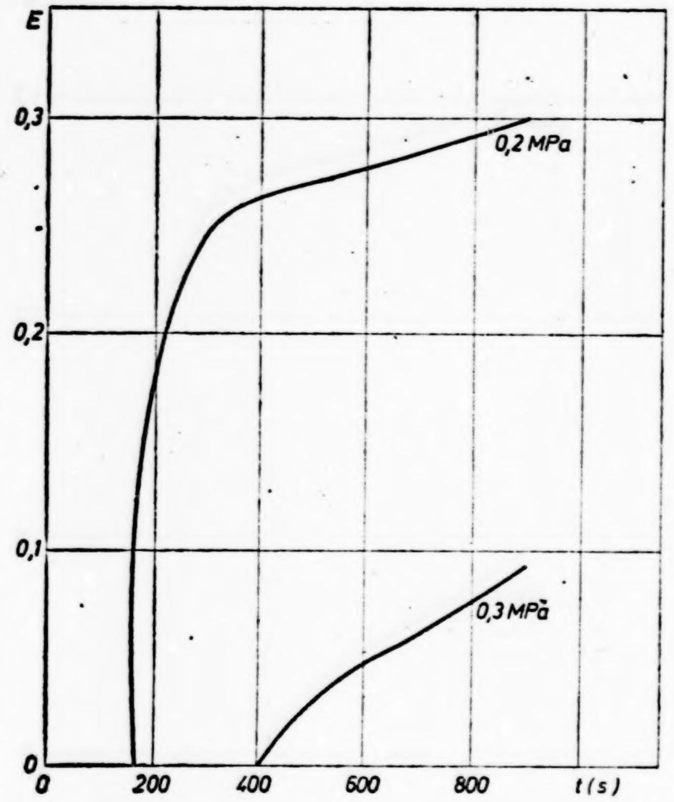

Fig. 6. Dependence of the emission of carbon dioxide on the time in the atmosphere of the breathing mixture O_2-He-N_2;hard-board, 3.2 mm thick

Based on an analysis of the decomposition of smoke concentrations and toxic volatile substances contained in the fire products, particularly dangerous to the human subjects, the authors have presented an analytical appraisal of the degree of smoke and toxic hazard, in case a fire would break out, of some separated compartments of the research underwater work complex. A detailed analysis of this problem as well as worked out mathematical relationships and criteria to be the guidelines for designers of the research and underwater work complexes are discussed in work [4].

CONCLUSIONS

On the basic of the own findings the following main conclusions can be worded:

1. The velocity of the surface spread of flame as well as the mass velocity of the combustion of determined non-metallic materials depend chiefly on the kind thickness of the material, pressure and kind of the intersphere (air or breathing mixture), position of the material tested and location of the source of ignition, intensity and time of heat irradiation of the material tested, also on the ventilation system adopted. A crucial factor in this respect is, among others, the partial pressure of oxygen in the intersphere of the pressure chamber.
2. From the point of view of the fire hazard of the decompression chamber the intersphere of the breathing

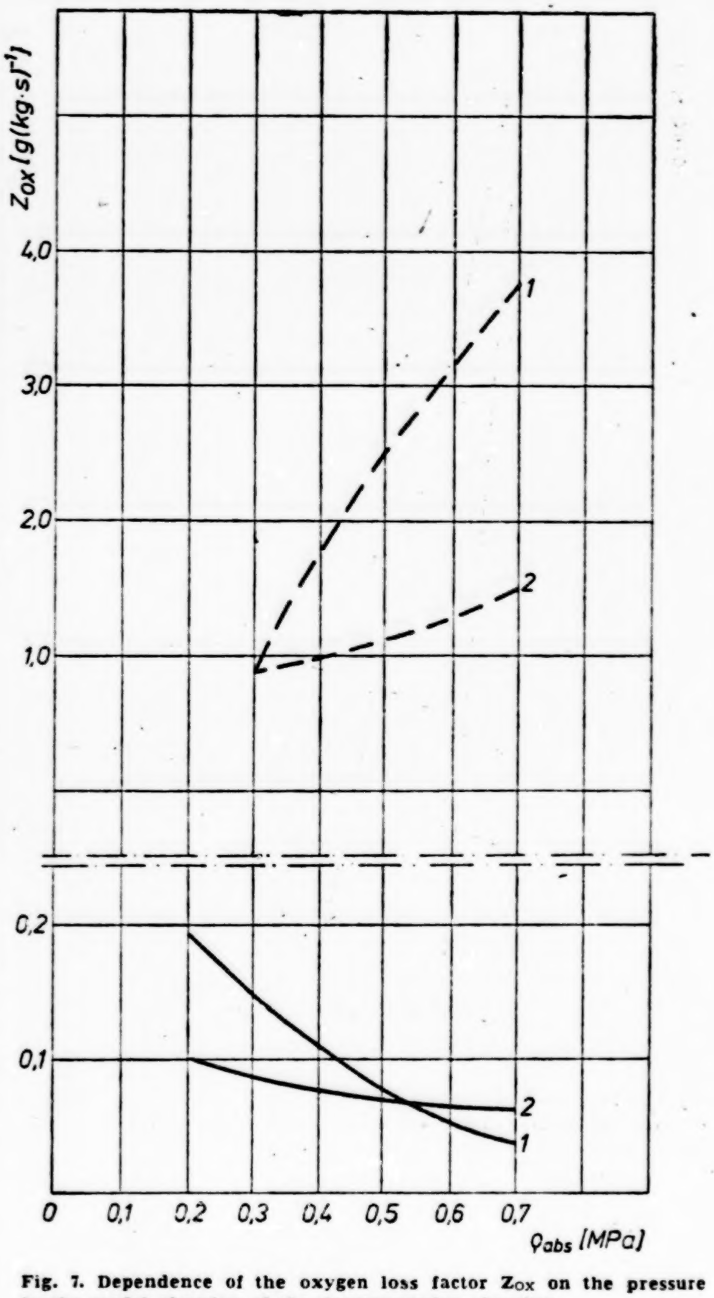

Fig. 7. Dependence of the oxygen loss factor Z_{OX} on the pressure in the model chamber of the decompression chamber
1 — hardboard, 3.2 mm thick, 2 — leafy plywood, 10 mm thick, – – – – air, ———— breathing mixture O_2-He-N_2

mixture O_2-He-N_2 is generally safer than that of the air, particularly at pressures exceeding 0·5 MPa.

3. A general appraisal of the thermal properties of the materials designed for the construction and outfit of the decompression chamber, which are decisive of their fire hazard, can be made on the basis of the results obtained from the laboratory tests carried out on their thermal properties within the range of adopted breathing mixtures from 0.1 to 0.7 MPa. This is due to the physiological constitution of the breathing mixtures for which the oxygen content determined by the partial pressure reaches for higher pressures a constant value (of about 0.0304 MPa) irrespective of the total pressure of the breathing mixture.

4. When designing the wiring system in the research and underwater work complex, deadlights and other electrical contact equipment should be located in special recesses of the upper parts of the decompression chamber and deep-sea diving bell.

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